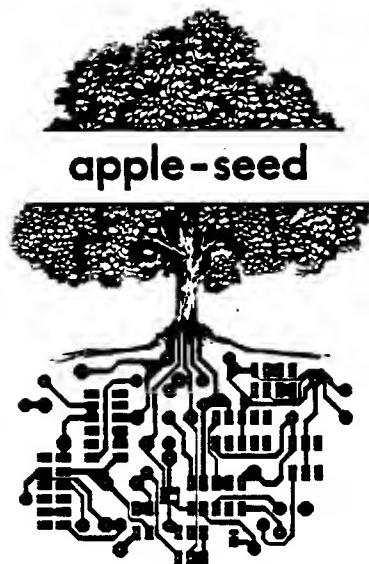


Cover design by Andrea



COMPUTER ASSEMBLY MANUALS
by
RAYMOND KOSMIC

- SURF BOARD: Assembly Guide for the 6502-based SURF BOARD Motherboard
- APPLE-SEED I: Motherboard Assembly Manual
- APPLE-SEED II: Assembly Guides for Apple-compatible Motherboards and Peripheral Circuit Cards
- APPLE-SEED II UP DATE: Latest Thirty Guides from APPLE-SEED II
- BIG BLUE SEED: Assembly Guides for IBM-compatible Motherboards and Peripheral Circuit Cards
- BIG BLUE SEED UP DATE: Latest Twenty-five Guides from the BIG BLUE SEED

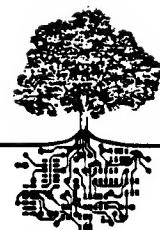
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To Juliet

PREFACE

This reference manual was prepared as an aid to those who wish to assemble Apple™-compatible peripheral circuit cards for their personal use. The sixty assembly guides presented here were originally prepared for Computer Parts Galore Inc., and Active Surplus Annex, and are distributed along with each card or kit as a parts list with condensed assembly instructions. The suppliers have kindly allowed us to compile these guides together into one reference manual.

Each one of the guides is complete in itself and is independent from the other guides. All have been checked for accuracy by the suppliers and our technical advisors, and are thought to be correct. However, with over four thousand components to be identified and correctly positioned on eighty-five cards, errors and/or omissions may occur. In no event will the suppliers or NuScope Associates be liable for damage resulting from the use of the information presented in this manual.

If you lack experience in electronics, you may wish to refer to the "apple-seed: Motherboard Assembly Manual". This self-directing guide was designed and written with the first-time hobbyist in mind, as an educational reference for the construction and assembly of electronic devices that use printed circuit boards, integrated circuits, and electronic devices.

It is planned to update this reference manual as other peripheral cards come to our attention. Any suggestions for improvement would be greatly appreciated.

ACKNOWLEDGEMENTS

I wish to express my appreciation to Tom Bell, Bramalea, John Kuzmich, Don Mills, and Andy Szego, Willowdale. Their valuable assistance and expert technical advice were instrumental in the completion of this manuscript.

ACKNOWLEDGEMENTS (Continued)

I also wish to thank the following suppliers for their encouragement and support, and for checking the accuracy of the peripheral circuit card guides as follows:

Rob Stewart and Bill Jackson of Computer Parts Galore Inc.,
316 College St W, Toronto, Ont, M5T 1S3:

Disk Controller (Two Drives); Disk Controller (Four Drives);
16 K RAM; 16 K RAM; Language; 128 K RAMCARD; ROM Integer;
80-Column; Z-80; Printer Buffer; Parallel Printer Interface;
Epson/Centronics Interface; Communications Interface; Serial;
Modemcard; Voice Machine; Copycard; EPROM Programmer; Time;
Input/Output; Multifunction; 80-Column/Soft Switch; Asynchronous
Interface; Music Machine; Three Voice Synthesizer;
AP-64 EPROM Writer, IEEE; A/D-D/A; Prototyping II.

Pete Brown and Fred Kohn of Active Surplus Annex, 345 Queen St
W, Toronto, Ont, M5V 2A4:

80-Column VK; Sprite Graphics; EK Z80; K-Modem300; Music
Card 1 and 2; Instrument Synthesizer MK1 and MK2 and Computer
Interface Cards; ROM Blaster; RGB; K-Clock; Prototyping I.

Bill Wood of 4863 South Livonia Road, Livonia, NY, 14487:

8" Floppy Disk Drive Controller

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PART I

GUIDELINES TO SUCCESS

SAFETY

When cutting excessive wire leads from resistors, diodes, etc., protect your eyes. Wear safety glasses and keep the card at a reasonably safe distance. Turn your head to the side when trimming component leads.

Treat the soldering iron with respect. A hot iron can inflict a nasty burn. Do not touch the soldered connections before they have cooled down. Always rest the hot iron on a soldering stand when not in use. Turn the soldering iron off when you leave your work area.

Work in a well-ventilated area.

Observe all electrical and fire safety precautions.

There's less chance of an accident if your work area is clean and well organized.

USING THIS GUIDE

Examine the various assembly guides presented in this manual and select the card that you wish to build. Study the card in detail before mounting any components. Handle the card only by its edges, NEVER by its surface. Fingerprints may leave a fine film of oil on the solder pads and prevent the solder from making a solid joint. Clean both sides of the card with a special commercial cleaner or denatured alcohol (methyl alcohol) before soldering.

Visually inspect the card for breaks, shorts, etch-flaws, and irregularities in the lands (tracks). Illuminate the card from the solder side with a strong light. Examine the tracks for shorts and hair-line fractures. Pay special attention to the component side where the tracks will be covered over with sockets. You won't get a second chance to inspect these areas once hidden with components. Check the inner surface of the plated-thru holes; a shiny appearance indicates that they are, in fact, plated-thru. On the other hand, a dull appearance suggests a poorly-made circuit card. If flaws exist, either make the necessary repairs or return the card to the dealer.

Compare the silk-screening on the bare card to the silk-screening on the layout in the text. Record all differences. Check the parts list for availability and price. Mentally position each socket and electrical component and device in place before beginning the actual assembly.

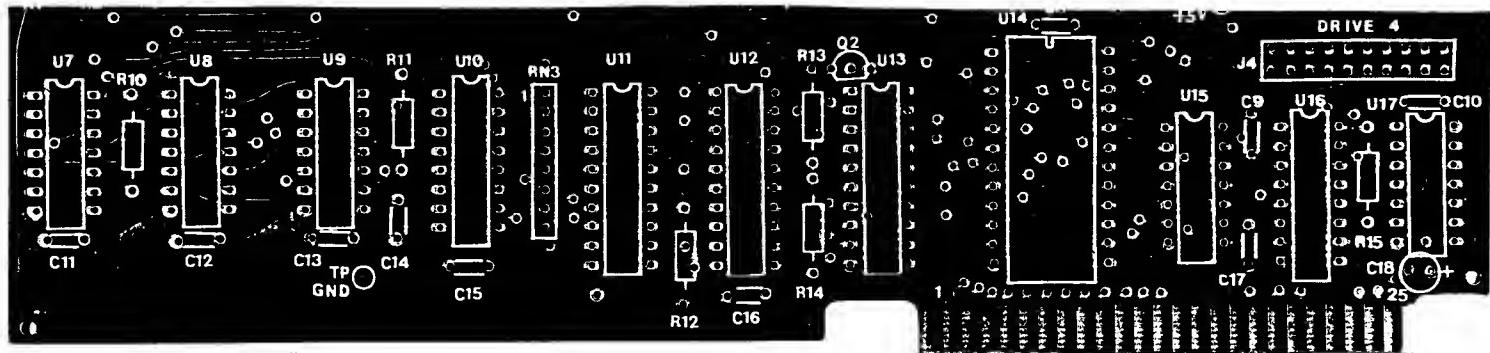
Orienteate the card so that the component side faces you and the edge-card contacts are at the LOWER RIGHT.

ALL COMPONENTS ARE MOUNTED ON THE COMPONENT SIDE
AND SOLDERED ON THE SOLDER SIDE

Study the precautions thoroughly (marked with an asterisk * in the guides) before you begin to assemble a circuit card.

Each one of the guides is complete and independent of the others in this manual.

Use the guide as a shopping list. Refer to Fig. 1, A Portion of an Assembly Guide. Check off each component purchased in the space provided on the guide. Circle the appropriate component placement number after it has been installed. Some peripheral cards have the silk-screened labels printed directly under socket placements making it impossible to know which integrated circuit (IC) to install. Refer to the component placement layout for IC positioning.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- | | | | | |
|----------|---|---------------------------------------|-------------|------------------------------------|
| <u>2</u> | - | 33 Ω @ R ₈ (9) | / | 1 - 5 K Ω @ R ₃ |
| <u>1</u> | - | 100 Ω @ R ₁₁ | / | 1 - 1 K Ω @ R ₁₀ |
| <u>1</u> | - | 470 Ω @ R ₁₂ | | |
| <u>4</u> | - | 680 Ω @ R _{1,2} | (6,7,13,14) | |
| <u>✓</u> | - | 4.7 K Ω @ R ₁₅ | | |
| <u>✓</u> | - | 47 K Ω @ R ₅ | | |
| <u>✓</u> | - | 1 M Ω @ R ₄ | | |
| ?? | - | 4S33 Ω SIP* (isolated) @ RN1,2 | | |
| , | - | 1.7 K Ω STD* (chipped) @ RN3 | | |

TRANSISTORS Q *Install the three EBC leads

- as shown B C

DIODES D

- 2 3 - LED *Position longer lead (anode)
NEED 1 of LEDs as shown
@ CR1,2,3 anode

CONNECTORS

- 4 - 2x10 male header strip, straight

FIG. 1. A PORTION OF AN ASSEMBLY GUIDE.

The correct sequence of installing components is debatable. Try to keep all the components flush against the board. As a general rule, mount the components that are shortest in height first (diodes, resistors, sockets), followed by the taller components (capacitors, switches, resistor networks, etc.). This helps to keep the components tight against the board when soldering.

In some situations, it may be more practical to install sockets first. This may eliminate some confusion as to the placement of the smaller components, especially if the card is inadequately silk-screened or cluttered.

Component leads are NEVER inserted into FEED-THRU holes. On some of the cards illustrated, the FEED-THRU holes are smaller and can thus be distinguished from the larger COMPONENT holes.

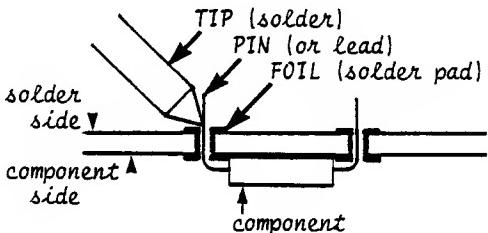
The spacing between two solder holes on any one circuit card is often the same for each type of component. Thus resistor leads are bent to the same length. By-pass capacitors ($0.1 \mu F$) have a smaller hole-to-hole spacing. This may help you to decide the mounting position of some of the components.

Use a low-wattage (less than 35 watts) soldering iron with a small pencil, pyramid, or screw-driver tip. Use only rosin-core, radio-type solder with a 60/40 or 63/37 tin/lead content. NEVER use acid-core solder! NEVER use a solder gun!

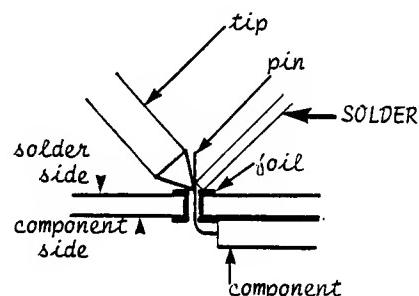
Take care with your soldering. The soldering iron TIP should make firm contact with the PIN or component lead and the solder PAD as illustrated in FIG. 2, Soldering Techniques. Apply solder to the opposite side of the pin touching both the pin and the pad. Follow this sequence:

IRON ON - SOLDER ON - SOLDER OFF - IRON OFF

Excessive heat may damage delicate components. If done correctly, soldering one pin or component lead should take no more than four to five seconds.



A. Three-Point Contact



B. Applying the Solder

FIG. 2. SOLDERING TECHNIQUES.

Some peripheral cards appear to have a preference for devices made by a specific manufacturer. The parts list shows this source in brackets following the device. Other devices that are followed by a manufacturer's name in brackets are made only by that manufacturer.

Some of the cards require modifications as illustrated in the MULTIFUNCTION CARD, GUIDE 10-4. Modifications are done on the solder side except where indicated. Study the details thoroughly before attempting any modifications.

Variations in silk-screening may be encountered in some of the circuit cards. Fig. 3 shows four variations of the 128 K RAMCARD. Compare these to the correctly silk-screened version in GUIDE 2-4. Component placement may be missing or incorrect. Integrated circuit pin number 1 may be turned thru 180°. Return these cards to the supplier. If, on the other hand, you do decide to assemble cards that are incorrectly silk-screened, work cautiously and systematically. Apply a small dab of typewriter correction fluid to mark and identify pin 1 of sockets and ICs.

GUIDE TO COMPONENTS

For a more detailed look at component identification and placement, and for installation techniques, refer to the "apple-seed: Motherboard Assembly Manual".

DIODES AND LIGHT EMITTING DIODES (D)

Diodes are delicate and can be easily damaged by rough handling and excess heat. These devices are polarized and must be correctly oriented on the circuit card. Position the banded (cathode) end of the diode towards the tip of the arrow as shown in following figure (Fig. 4).

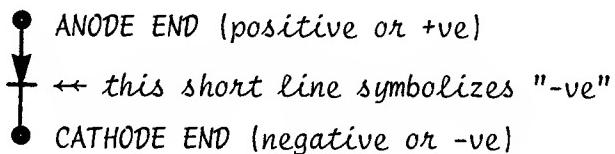


FIG. 4. IDENTIFYING THE CATHODE ON THE LAYOUT.

The polarity of light emitting diodes (LEDs) may be identified in one of the following ways:

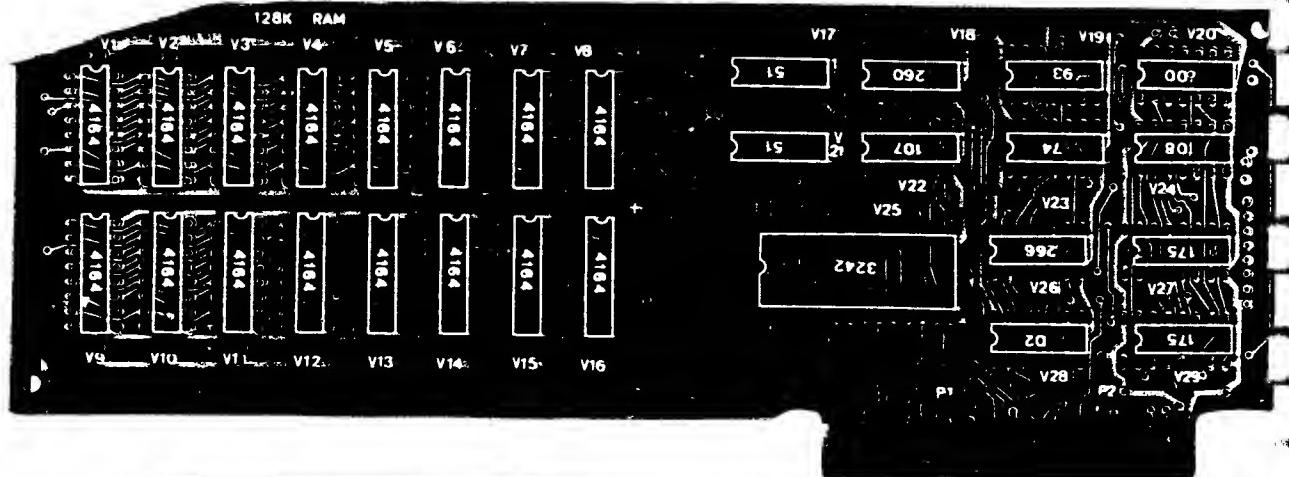
- ve: a small "dot" on the body of the device
- ve: base of the device is "flat"
- +ve: the "longer" terminal or lead

INDUCTORS (L)

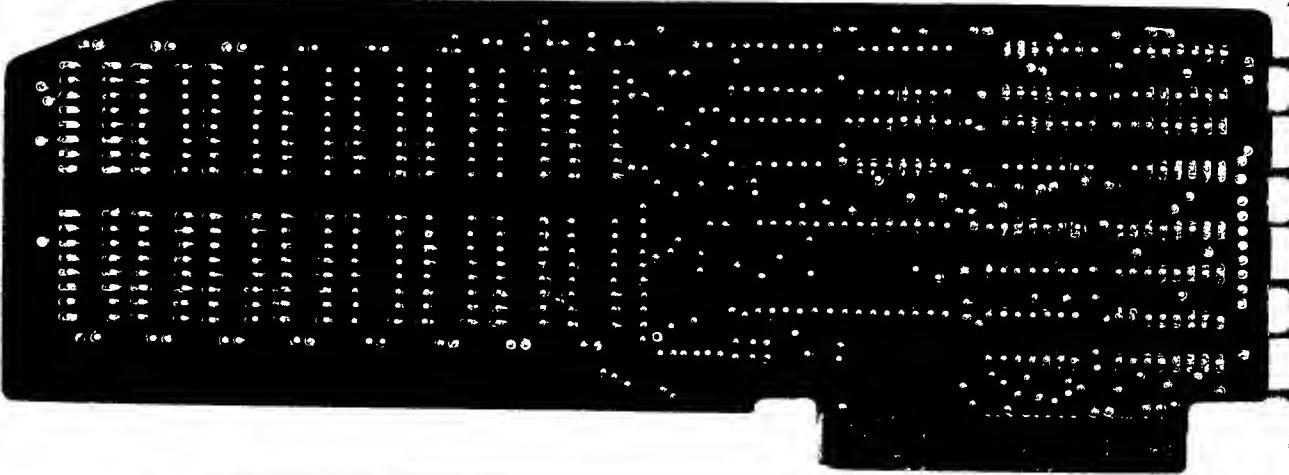
The numerical value of inductors (coils) may be colour-coded on the body of the device. This value, in microhenries (μ H), can be determined using Table I, Resistor Colour Code Chart.

FIG. 3. VARIATIONS OF THE 128 K RAMCARD. Refer to GUIDE 2-4 for the CORRECT component placement. (Reduced in size).

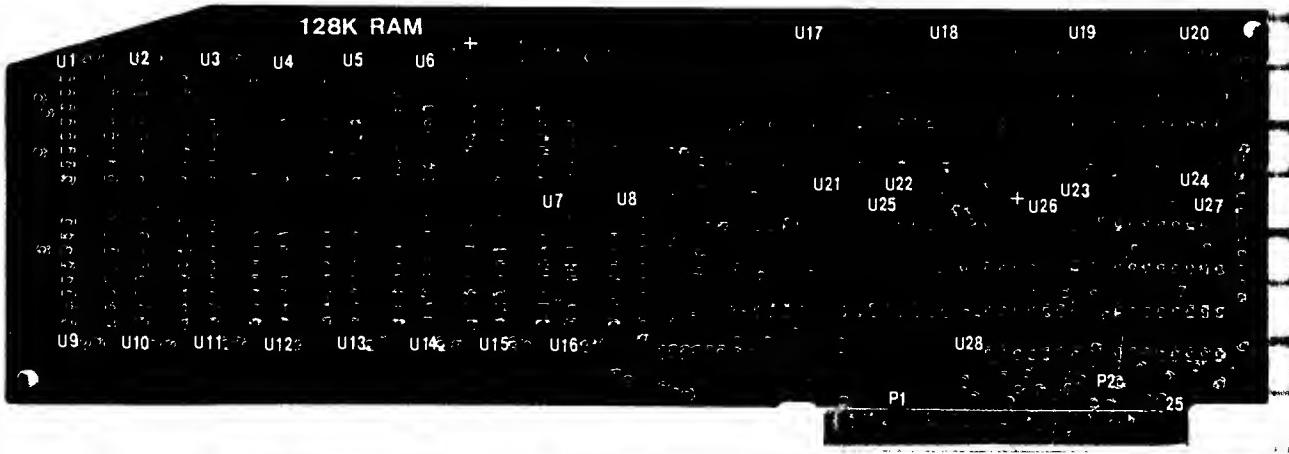
VARIATION
I
INCORRECTLY
SILK-SCREENED



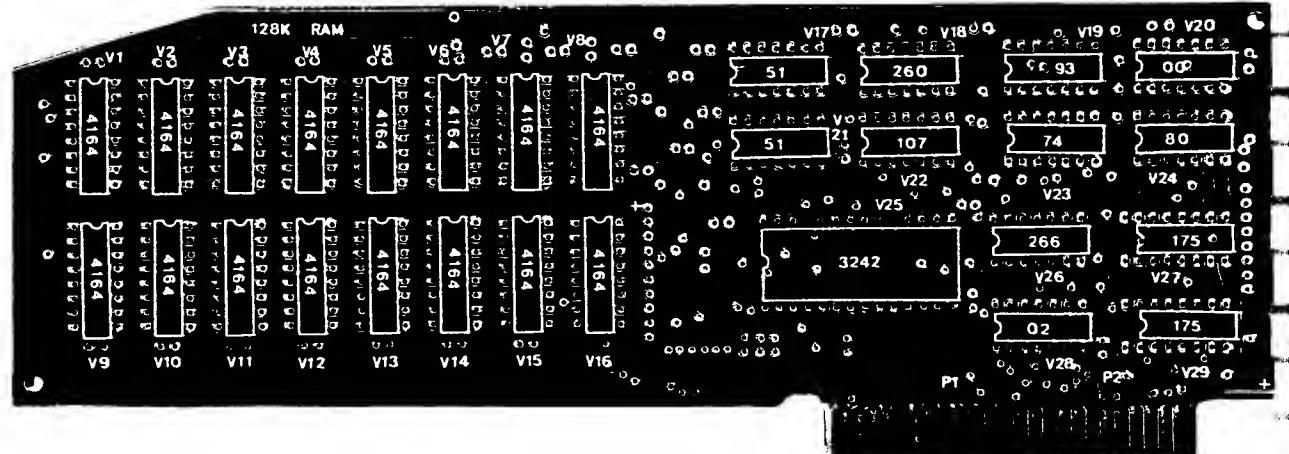
VARIATION
II
NOT
SILK-SCREENED



VARIATION
III
INCOMPLETELY
SILK-SCREENED



VARIATION
IV
INCORRECTLY
SILK-SCREENED



RESISTORS (R)

The resistors used to assemble the majority of peripheral cards illustrated in the manual are $\frac{1}{4}$ watt, with a tolerance of 5 percent (%). Refer to Table I, Resistor Colour Code Chart, to determine the ohms value of resistors.

Table I. Resistor Colour Code Chart.

band 1 → shows 1st number value
 band 2 → shows 2nd number value
 band 3 → shows multiplier
 band 4 → shows % tolerance

colour	1st digit	2nd digit	multiplier
black	0	0	1
brown	1	1	10
red	2	2	100
orange	3	3	1,000
yellow	4	4	10,000
green	5	5	100,000
blue	6	6	1,000,000
violet	7	7	10,000,000
gray	8	8	100,000,000
white	9	9	1,000,000,000
gold	-	-	0.1
silver	-	-	0.01

- EXAMPLES: a) yellow, red, black, refers to
 4 7 X1 = 47 Ω (ohms)
- b) brown, green, red, refers to
 1 5 X100 = 1,500 ohms or 1.5 KΩ (K = Kilo)

The MODEMCARD, GUIDE 7-2, requires "precision" resistors. The first three bands of these resistors designate the numerical value; the fourth band the multiplier. A large gap separates the fourth and fifth band. The fifth band shows the % tolerance.

Pin 1 of single-in-line package (SIP) resistors or resistor networks (RN) is common and must be positioned correctly on the card. Pin 1 may be identified by a "dot", a "bar", or a number "1" on the body of the device. Most cards require SIP "bussed" resistors. The DISC DRIVE CARD, GUIDE 1-3, on the other hand, uses SIP "isolated" resistors. If isolated SIPs are not available substitute the same number of single resistors of the same value. Stand them on their end as shown in Fig. 5, Installing a Resistor on its End. Leave a small gap between the end of the resistor and the circuit card to prevent "solder wicking", i.e., solder creeping along the card and possibly causing a short circuit.

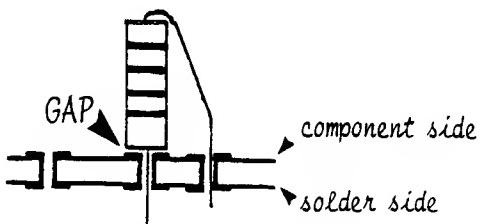


FIG. 5. INSTALLING A RESISTOR ON ITS END.

A SIP resistor with the correct number of pins may not always be available. Purchase one with more pins than required and cut off the extra number of pins as close to the body of the device as possible. Do NOT REMOVE pin number 1. Do NOT allow the cut portion of the pins remaining on the device to touch the circuit card as they may cause a short circuit.

SOCKETS

It is strongly recommended that ALL integrated circuits be socketed. One of the best forms of trouble-shooting is "chip-swapping". Use high-quality dual-in-line (DIP) solder-tail IC sockets.

CHECK AND RECHECK THAT:

- pin 1 of each socket is properly oriented on the card
 - each socket is installed in the correct position, i.e.,
a 14-pin socket is not mounted in a 16-pin opening
 - ALL socket pins have passed thru ALL holes, i.e., no
folded-under pins
 - each socket is flat against the card.

Do NOT attempt to remove a socket if it has been installed with pin 1 positioned incorrectly, i.e., socket turned thru 180°. Instead, apply a very small dab of typewriter correction fluid to the corner of the socket to identify pin number 1.

CAPACITORS (C)

Capacitors are either electrolytic (polarized) or non-electrolytic (non-polarized). Polarized capacitors must be connected in the circuit so that their positive and negative terminals are correctly positioned in the circuit. Match the +ve terminal of these capacitors with the +ve end as shown on the layout. Non-polarized capacitors have neither +ve nor -ve ends and may be installed in the circuit in any manner. Capacitors of values greater than 0.1 μF are generally polar. Refer to Table II for the capacitance and tolerance of capacitors.

Table II. Multiplier and Tolerance Chart for Capacitors.

MULTIPLIER		TOLERANCE		
for the number:	multiply by:	10 pF* or less	letter	over 10 pF
0	1	$\pm 0.1 \text{ pF}$	B	-
1	10	$\pm 0.25 \text{ pF}$	C	-
2	100	$\pm 0.5 \text{ pF}$	D	-
3	1,000	$\pm 1.0 \text{ pF}$	F	$\pm 1\%$
4	10,000	$\pm 2.0 \text{ pF}$	G	$\pm 2\%$
5	100,000	-	H	$\pm 3\%$
-	-	-	J	$\pm 5\%$
8	0.01	-	K	$\pm 10\%$
9	0.1	-	M	$\pm 20\%$

*pF = picofarad

EXAMPLES: a) 221K printed on the device refers to a value of $22 \times 10 = 220 \text{ pF}$ with a tolerance of $\pm 10\%$

b) 104M refers to $10 \times 10,000$ or $10 \times 10^4 = 100,000 \text{ pF}$ or $0.1 \mu\text{F}$, $\pm 20\%$

Voltage ratings, usually printed on the component, show how much voltage can safely be used without damaging the capacitor. The rating must be higher than the highest voltage in the circuit.

Install variable capacitors (trimmers or trimcaps) so that the common terminals of the device are aligned with the common solder pads on the card.

TRANSISTORS (Q)

Handle transistors with care. Protect them from mechanical injury. Use minimum heat when soldering. Transistors may be destroyed if their three leads are incorrectly positioned in the circuit. Identifying the emitter, collector, and base (EBC) terminals however, presents a problem: the body of the device may or may not be labelled; the circuit board may or may not be silk-screened; different manufacturers arrange the EBC leads differently. If in doubt, check with your dealer.

CRYSTALS (Y)

Crystals are delicate. A severe jolt may chip the crystal suspended in the metal case. Install crystals last to prevent excessive movement while working on other components. Fold the body of the device flat against the card before soldering if space is available on the card. Insulate the crystal from the card with two-way tape to prevent short circuits. Some of the cards have feed-thru holes at each side of the crystal so that the device can be secured in place. Refer to the MODEMCARD, GUIDE 7-2.

INTEGRATED CIRCUITS

Treat ICs with care. Handle them by the body, not the pins. Protect them from mechanical injury.

The power must be OFF when inserting or removing ICs or other devices. Excessive voltage, reversed polarity, short circuits, etc., can quickly destroy an IC. ICs must be correctly positioned in the circuit. Pin 1 of ICs can be identified by a "dot", a "triangle", a "1", a "notch", etc. Match pin 1 of ICs with pin 1 on the layout.

Metal-Oxide-Silicon (MOS) and Complementary Metal-Oxide-Silicon (CMOS) integrated circuits are very sensitive to static electrical discharge, and require special handling. Store them in their original shipping tubes or with their pins embedded in special conductive foam. Linear ICs are moderately sensitive, whereas Transistor-Transistor Logic (TTL) ICs are relatively insensitive to static discharge.

Difficulties in running some software programs may result when using RAM (Random-Access Memory) ICs of different speeds. Use 200 ns (nanosecond) RAM on both the motherboard and the peripheral cards, except where specified in the guide.

Keep EPROMs (Erasable Read-Only Memory) away from direct sunlight. Ultraviolet (UV) radiation of sunlight may partially erase some of the information programmed in an EPROM. Protect them by applying a non-transparent piece of tape or label over the transparent window on top of the device.

In some cases, it may be more convenient to use PROMs (Programmable Read-Only Memory) other than those specified in the guides. Refer to Table III, PROM Cross-Reference Chart, for appropriate substitutes.

Firmware (software written into EPROMs or PROMs) is the responsibility of the builder and can be programmed according to the wishes of the individual.

Table III. PROM Cross Reference Chart Showing the Manufacturer and the Corresponding Part Number. *Are used in Guides.

HAR	MMI	NAT	SIG	T.I.
7603	6331	74S88	82S123*	18S030
-	6309*	74S471	-	28S22
7649*	6349*	74S472	82S147*	28S42
7611	6301	74S287	82S129*	28S10

HAR - Harris

MMI - Monolithic Memories

NAT - National Semiconductors

SIG - Signetics

T.I. - Texas Instruments

CARD INSTALLATION AND REMOVAL

DEDICATED SLOTS

Remove the cover of the computer. Locate the row of eight edge connectors on the motherboard. Refer to Fig. 6, Top View of Motherboard, for slot numbering. These conventions are generally followed by most users.

- SLOT Ø - Memory (RAM or ROM) Card
- SLOT 1 - Printer Card
- SLOT 3 - 80-Column Card
- SLOT 6 - Disc Controller Card

CARD INSTALLATION

Turn the POWER OFF before installing or removing ANY peripheral card. Failure to do so will likely result in circuit damage to the card, other cards, and the motherboard.

Discharge STATIC ELECTRICITY in your body by touching the metal case of the power supply.

Orientate the peripheral card so that the SOLDER SIDE faces the power supply. Position the card carefully in the slot so that no "sliding" FRONT-TO-BACK movement occurs. This movement may strip the gold contacts from the card.

Insert the gold-plated fingers of the card into the appropriate connector. Gently rock the card from FRONT-TO-BACK while gently applying downward pressure. (Refer to Fig. 6 for the front-to-back orientation). The card must be firmly seated in the slot before turning on the power.

CARD REMOVAL

POWER OFF

DISCHARGE STATIC ELECTRICITY

ROCK FRONT-TO-BACK WHILE APPLYING UPWARD PRESSURE

PRECAUTIONS

Do NOT rock the card from side-to-side

Do NOT touch the gold-plated contact fingers of the card

Do NOT unnecessarily install and remove cards. Some poor-quality card-edge connectors may break down creating poor or non-existent contacts.

Do NOT apply excessive force. You may flex the motherboard sufficiently to break one or more of the tracks.

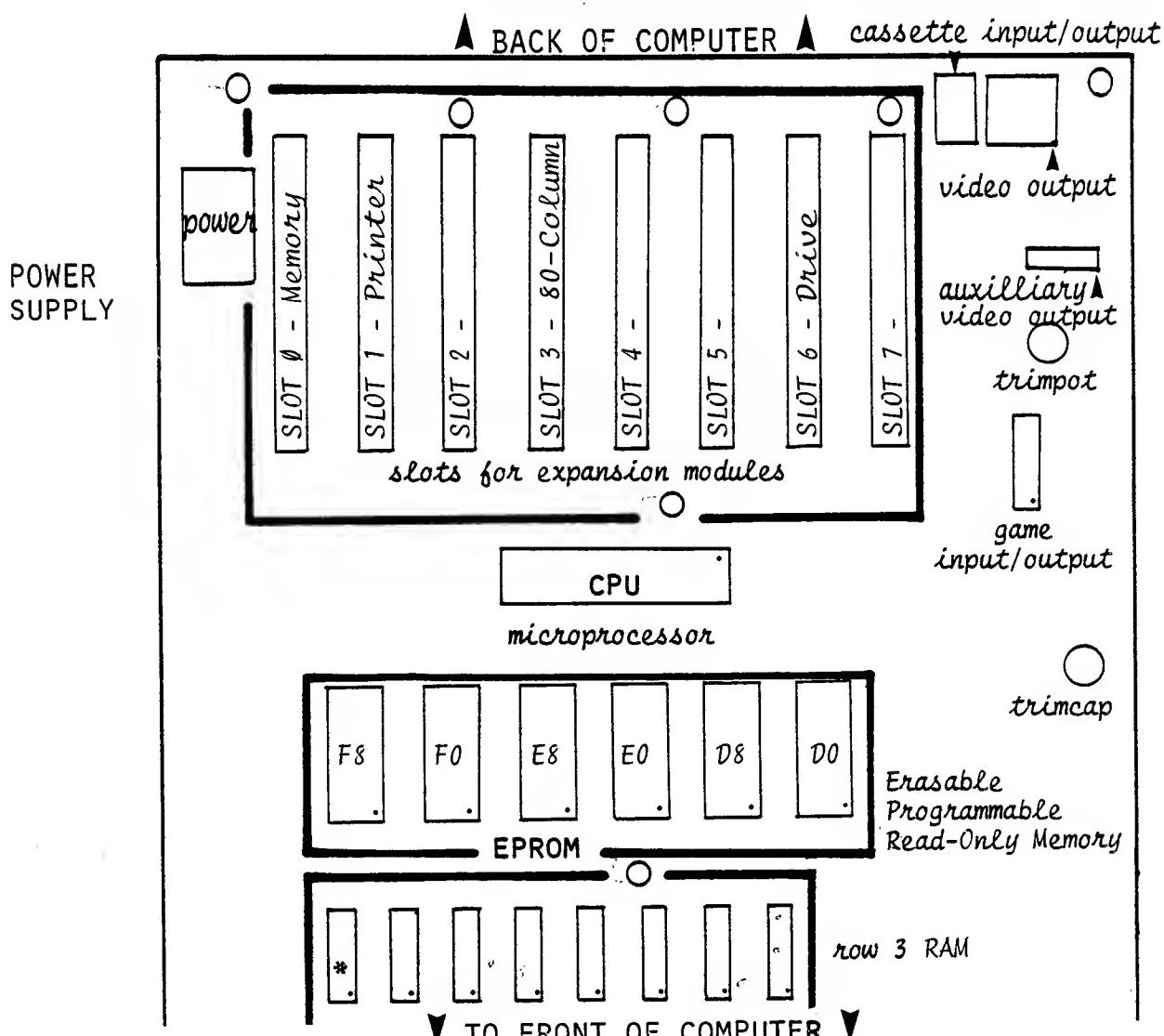


FIG. 6. A PORTION OF THE TOP VIEW OF THE MOTHERBOARD SHOWING FRONT-TO-BACK ORIENTATION AND DEDICATED SLOTS. Install ribbon cable from memory

CARD AND CONNECTOR PINOUT

Refer to Fig. 7 for the pinout for both the edge connector and the peripheral card. The reproductions are close to original size. To quickly identify any one of the pins or contacts, lay the card along the edge of the centre diagram and directly read off the pin number. Do NOT mistakenly interchange the component side with the solder side. Note the relative position of the power supply to the left of the motherboard.

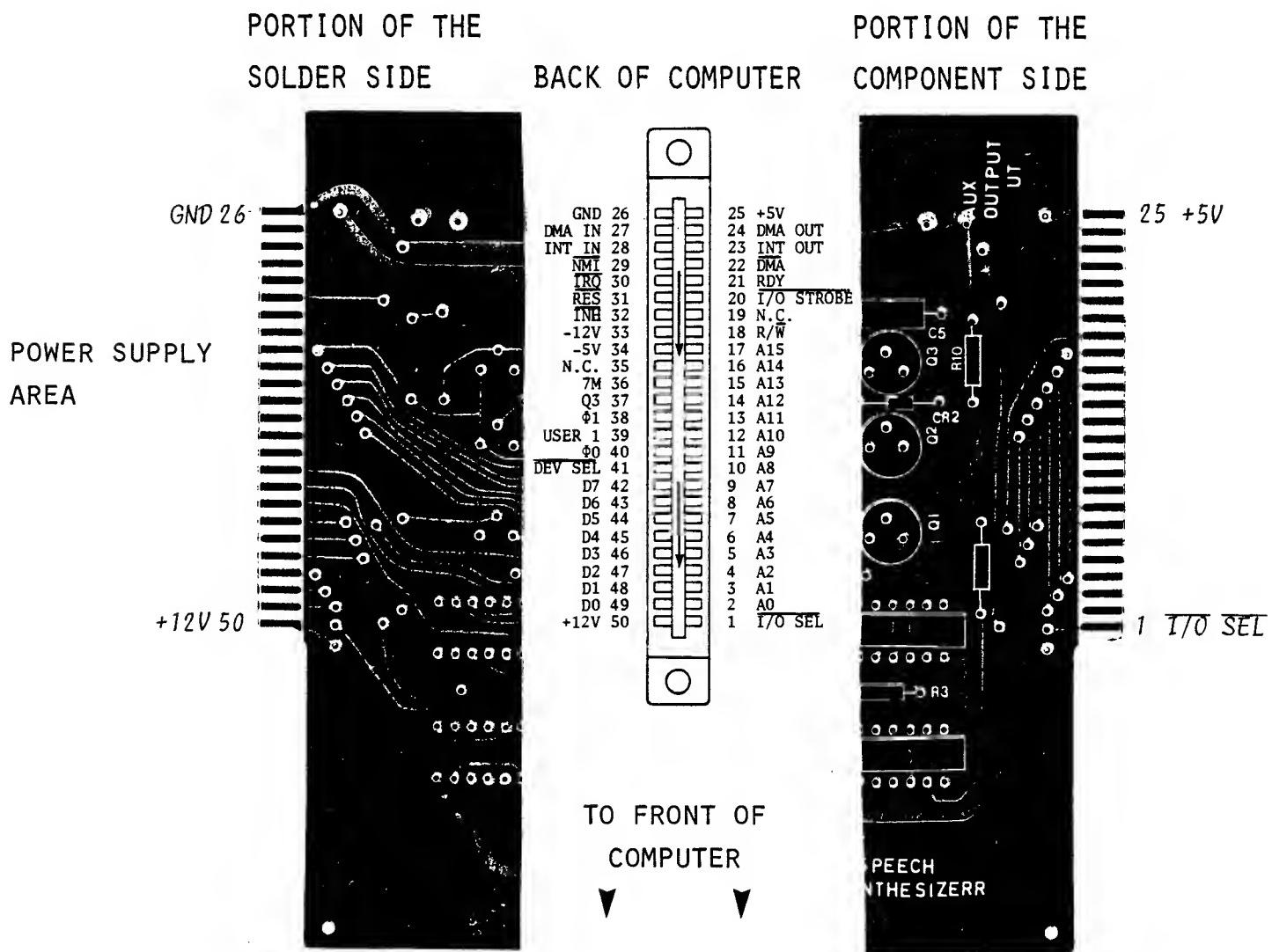


FIG. 7. PINOUT FOR THE EDGE CONNECTOR (CENTRE) AND BOTH SIDES OF THE PERIPHERAL CARD. Reproductions are close to original size.

APPENDIX**ABBREVIATIONS**

Alt	- Alternate
B	- Base (Transistor)
BIT	- Binary digit
BYTE	- a group of 8 BITS
C	- Collector (Transistor)
C	- letter code for Capacitor
CharGen	- Character Generator
CMOS	- Complementary Metal-Oxide-Silicon
Cont	- Controller
CP/M	- Control Program for Microprocessors
CPU	- Central Processing Unit
CRT	- Cathode Ray Tube
D	- letter code for Diode
DIN	- European type connector
DIP	- Dual In-line Package
D.C.	- Direct Current
DOS	- Disk Operating System
DRAM	- Dynamic RAM
DPDT	- Double-Pole, Double-Throw
DUART	- Dual Asynchronous Receiver Transmitter
E	- Emitter (Transistor)
EPROM	- Erasable PROM
FDC	- Floppy Disk Controller
FET	- Field Effect Transistor
GND	- Ground
Hires	- High Resolution
Hz	- Hertz
IC	- Integrated Circuit
IEEE	- Institute of Electrical and Electronic Engineers
I/O	- Input/Output
J	- Jumper
K	- Kilobyte, 1,024 bytes
L	- letter code for Coil or Inductor
LED	- Light Emitting Diode
LPT	- Line PrinTer
M	- Megabyte, 1,024,000 bytes
MOS	- Metal-Oxide-Silicon
MPU	- Microprocessing Unit
-ve	- negative
NiCad	- Nickel Cadmium
ns	- nano second
+ve	- positive
P	- post
PAL	- Programmed Aray Logic
PC	- Printed Circuit
PCB	- Printed Circuit Board
PG	- Power Good

Q - letter code for Transistor
 R - letter code for Resistor
 R - Ring
 RAM - Random-Access Memory
 RF - Radio Frequency
 RGB - Red, Green, Blue
 RN - Resistor Network
 ROM - Read-Only Memory
 RTN - Return
 S - Schottky
 S, SW - Switch
 S,SPKR - Speaker
 SIP - Single In-line Package
 SPDP - Single-Pole, Double-Throw
 TP - Terminal Post
 Trimcap - Trim capacitor
 Trimpot - Trim potentiometer
 TTL - Transistor-Transistor Logic
 UV - Ultra Violet
 V - Volt
 Vid - Video
 VR - Variable Resistor
 XTAL - Crystal
 XTL - Crystal
 Y - letter code for Crystal
 ZIF - Zero Insertion Socket

METRIC PREFIXES Decimal points and large numbers are avoided.

p	pico	10^{-12}
n	nano	10^{-9}
μ	micro	10^{-6}
m	milli	10^{-3}
-	-	1.0^1
k	kilo	10^3
M	mega	10^6
G	giga	10^9

PART II

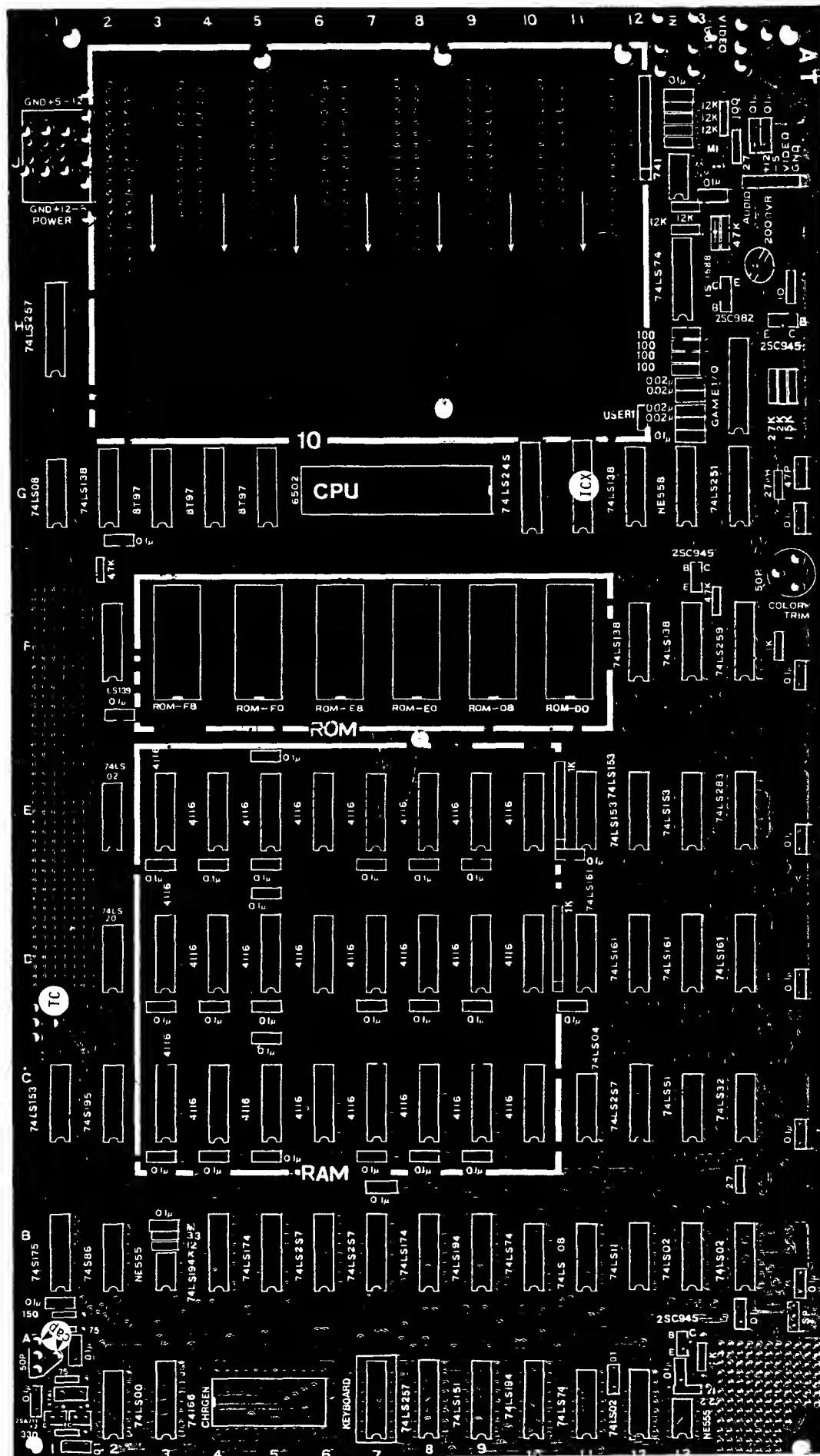
PERIPHERAL CIRCUIT CARD

ASSEMBLY GUIDES

Study PART 1, GUIDELINES TO SUCCESS, before attempting
to assemble any of the following peripheral cards.

GUIDE SB-1

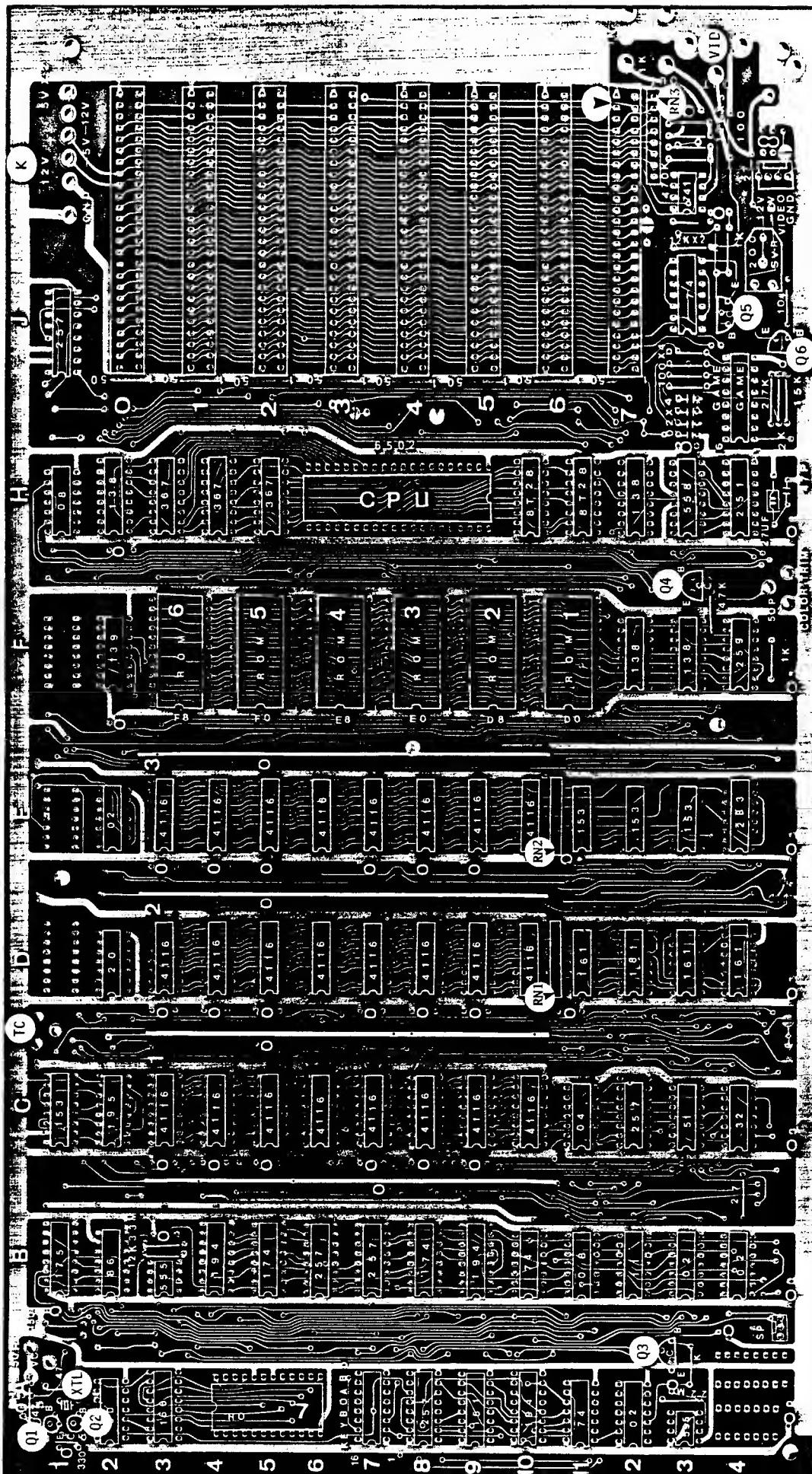
MOTHERBOARD I: System board features: 6502 MPU; 48 K bytes of RAM expandable to 64 K and up with memory card(s); eight expansion slots for numerous peripherals; colour graphics capability; I/O ports. Requires firmware (six 2716 EPROMs, or three 2732 EPROMs with modifications). Supports a variety of operating systems and programming languages.



NB Layout is reduced. Actual size is 21.8 x 306.3 cm
Install one 50 pF regular capacitor @ cap if colour is missing

GUIDE SB-2

MOTHERBOARD II: System board-2 features: 6502 MPU; 48 K bytes of RAM expandable to 64 K and beyond with memory card(s); eight expansion slots for numerous peripherals; colour graphics capability; I/O ports. Requires firmware six 2716 EPROMs) and modification (one cut on the solder side). Supports a variety of operating systems and programming languages.



CHERBOARD II (continued) SUGGESTED SEQUENCE *INDICATES A PRECAUTION

*Position banded (cathode) end
diode towards the arrow
1N914

1.5S R $\frac{1}{4}$ watt, 5% @ \bullet \bullet

10 Ω

27 Ω

47 Ω

100 Ω

150 Ω

330 Ω

1 k Ω

1.5 k Ω @ 15K

1.5 k Ω

2 k Ω

2.7 k Ω @ 27K

2.7 k Ω

4.7 k Ω @ 47K

4.7 k Ω

12 k Ω

470 k Ω

2.2 M Ω @ 22M

3.3 M Ω @ 33M

1 k Ω 8-pin SIP* bussed @ RN1,2,3

*Match pin 1 of SIPs with pin

1 (arrow) on the layout

200 Ω Trimpot @ SV-R

27 or 33 μ H @ 27 μ F

14-pin

16-pin

24-pin

40-pin

47 pF @ 47P

0.02 μ F @ 02x4

0.1 μ F @ $\bullet\bullet\bullet$

50 pF Trimpot @ TC

*NOTE MODIFICATIONS

TRANSISTORS Q *Match EBC transistor leads
with the EBC leads on the layout

2 - 2N4258 @ Q1,2

3 - 2N3904 @ Q3,4,6

1 - MPSA13 @ Q5

CRYSTAL Y *Solder case of crystal to
ground

1 - 14.31818 MHz @ XTL

CONNECTORS

1 - RCA video jack @ VID

2 - audio jacks @ IN OUT

1 - 1x3 header, straight, male @ SP

1 - 1x4 header, straight, male @ K-14

1 - power plug @ K-1

8 - 50-pin card edge connector*

*CHECK possible point for short

on slot 7 (K-12) as follows: trace from
pin 24 between pins 26 & 27 as shown

on layout on COMPONENT SIDE

INTEGRATED CIRCUITS (continued)

5 - 74LS257

1 - 74LS259

1 - 74LS283

3 - 74LS367 or 8T97

1 - 74S86 @ 86

1 - 74S175 @ 175

1 - 74S195 @ 195

1 - 74166 @ 166

2 - 8T28

2 - NE555

1 - NE558

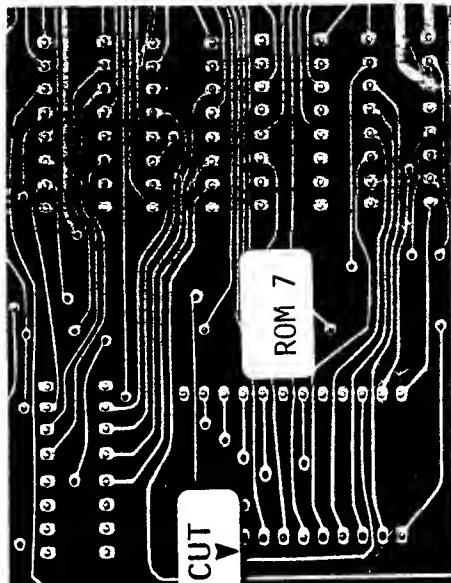
1 - 741

1 - 6502 CPU

7 - 2716 EPROMs @ ROM 1,2,3,4,
ROM 5,6,7

24 - 4116 dynamic RAM 200 ns
or faster

*MODIFICATION REQUIRED ON SOLDER
SIDE @ A-5,6 as shown below:
Cut trace from pin 9 of ROM 7 to
line leading from pin 22 of ROM 7



INTEGRATED CIRCUITS *Match pin 1 of ICs
with pin 1 on the layout

1 - 74LS00

4 - 74LS02

1 - 74LS04

2 - 74LS08

1 - 74LS11

1 - 74LS20

1 - 74LS32

1 - 74LS51

3 - 74LS74

4 - 74LS138

1 - 74LS151

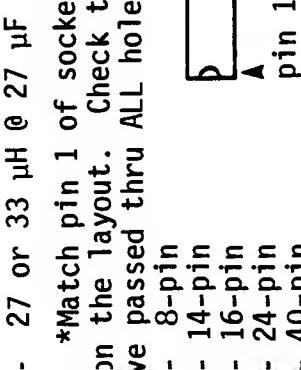
4 - 74LS153

2 - 74LS161

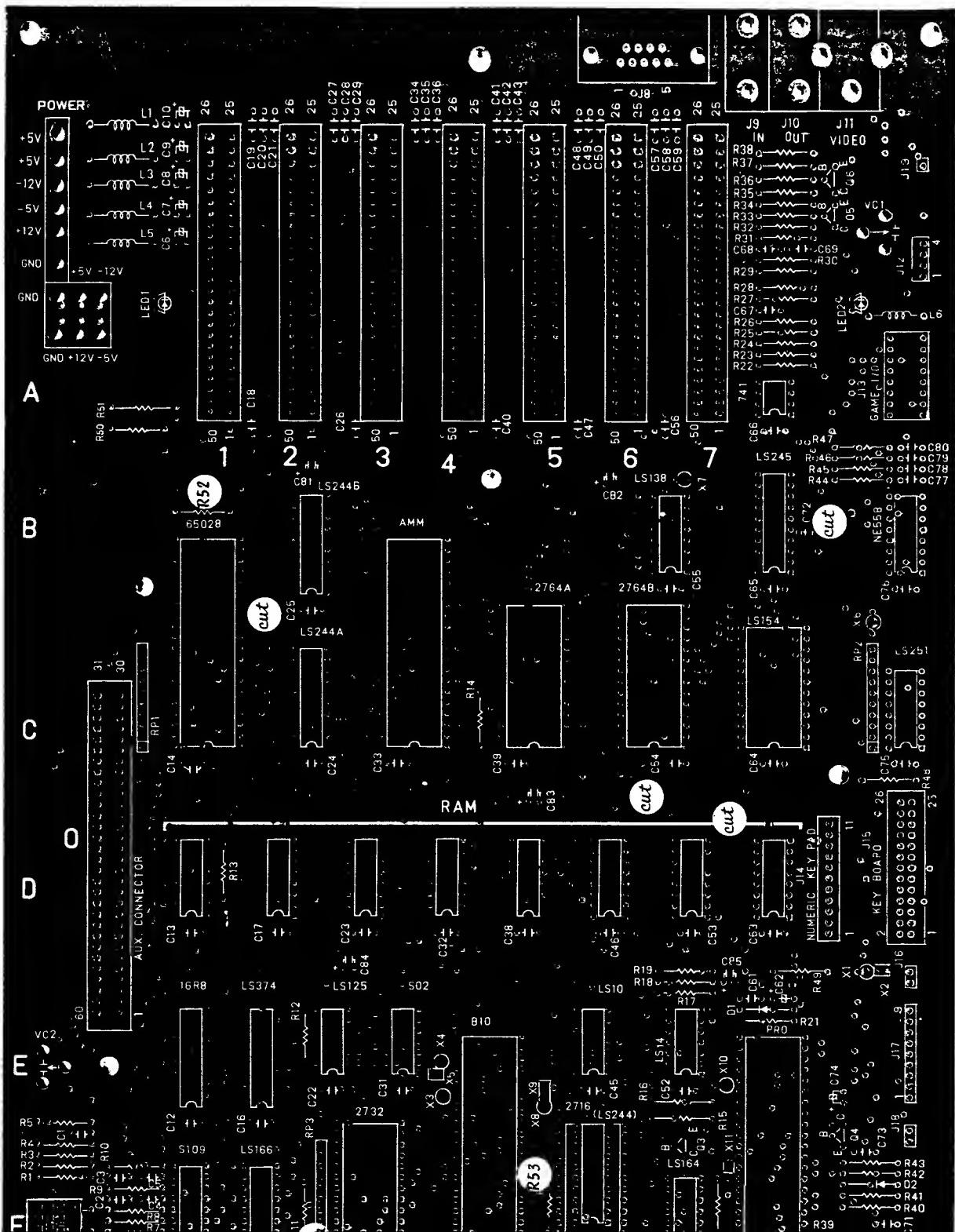
3 - 74LS174

1 - 74LS194

1 - 74LS251



ION 6502B/65C02 MOTHERBOARD: System Board features include: 6502B or 65C02 MPU; eight expansion slots for numerous peripherals (one 60-pin auxiliary slot and seven 50-pin slots); colour graphics capability; I/O ports. Requires modifications (four cuts on the component side), firmware (one 2716, one 2732 and two 2764 EPROMs), and three specialized ICs. Supports various operating systems and programming languages.



RON 6502B/65C02 MOTHERBOARD (continued) *INDICATES A PRECAUTION

ES D *Position banded (cathode) end
of diode towards the arrow

2 - 1N914 @ D1,2

STORS R $\frac{1}{4}$ watt, 5% *R51 is 1 watt
*R20 is not equipped

3 - 47 Ω @ R5,13,14

1 - 51 Ω @ R4

2 - 75 Ω @ R38,40

7 - 100 Ω @ R27,36,37,44,45,46,47

1 - 100* Ω @ R51* 1 watt

5 - 120 Ω @ R1,6,8,9,10

1 - 150 Ω @ R2

2 - 200 Ω @ R41,50

1 - 270 Ω @ R3

1 - 330 Ω @ R31

2 - 470 Ω @ R43,48

6 - 1 k Ω @ R7,11,12,29,35,52

1 - 2.7 k Ω @ R30

2 - 4.7 k Ω @ R16,53

1 - 5.6 k Ω @ R33

2 - 6.8 k Ω @ R32,34

4 - 10 k Ω @ R17,18,19,21

5 - 12 k Ω @ R22,24,25,26,28

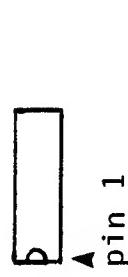
1 - 22 k Ω @ R15

1 - 47 k Ω @ R49

1 - 51 k Ω @ R42

1 - 100 k Ω @ R39

1 - 1 M Ω @ R23



LIGHT EMMITTING DIODES D *Position

flat part or shorter 1 lead of
LED towards the arrow on layout

2 - LED @ LED1,2

CAPACITORS C

2 - 47 pF @ C69,70

1 - 50 pF @ C21a @ location F-3

1 - 100 pF @ C68

4 - 220 pF @ C2,3,4,5

5 - 0.022 F @ C61,77,78,79,80

61 - 0.1 μ F Monolithic @ C1,11 to 60,

@ C63,64,65,66,67,71,72,

@ C73,75,76

12 - 10 μ F/16V Tantalum* @ C6,7,8,9,

@ C10,62,74,81,82,83,84,85

*Match + of Tantalaums

with + on the layout

2 - 50 pF Trimcap @ VC1,2

TRANSISTORS Q *Match EBC transistor leads

with EBC on the layout

2 - 2N3904 @ Q3,6

3 - 2N3906 @ Q1,2,5

1 - MPSA13 @ Q4

CRYSTAL Y *Fold crystal flat against the

board before soldering.

1 - 14.31818 MHz @ XTAL1

COIL (CHOKE) L

1 - 27 μ H @ L6

5 - Ferrite bead*, four-hole @ L1,2,3,

@ L4,5

1 - 74S02 @ E-4

1 - 74S109 @ F-1

1 - NE558 @ B-11

1 - 741 @ A-10

CONNECTORS

HEADERS male, straight

1 - 1x4 @ J12 RF converter

1 - 1x11 @ J14 Num keypad

1 - 2x13 @ J15 Keyboard

1 - 1x2 @ J16

1 - 1x9 @ J17

1 - 1x2 @ J18 Speaker

1 - 1x1 @ J19 Video out

CONNECTORS

1 - 6-pin power @ POWER

1 - DE9S female, 90 @ J8

2 - Audio jacks @ J9,10

1 - RCA phono jack @ J11

1 - 60-pin card edge connector @ P

7 - 50-pin card edge connector

@ 1,2,3,4,5,6,7

INTEGRATED CIRCUITS *Match pin 1 of ICs

with pin 1 on the layout

1 - 74LS14 @ Location E-9

1 - 74LS10 @ E-8

1 - 74LS125 @ E-3

1 - 74LS138 @ B-9

1 - 74LS154 @ C-10

1 - 74LS164 @ F-9

1 - 74LS166 @ F-2

2 - 74LS244 @ B-3, C-3

1 - 74LS245 @ B-10

1 - 74LS251 @ C-11

1 - 74LS374 @ E-2

1 - 74S02 @ E-4

1 - 74S109 @ F-1

1 - NE558 @ B-11

1 - 741 @ A-10

NOTES

Match pin 1 of the following SIPs
(bussed) with pin 1 (square pad)

on the layout

1 - 1 k Ω 10-pin SIP @ RP2

2 - 3.3 k Ω 10-pin SIP @ RP1,3

1 - 1 M Ω 8-pin

1 - 1 k Ω 10-pin SIP @ R23

1 - 1 k Ω 10-pin SIP @ RP1,3

1 - 1 k Ω 8-pin

1 - 1 k $\Omega</math$

BELTRON 6502B/65C02 MOTHERBOARD (continued)

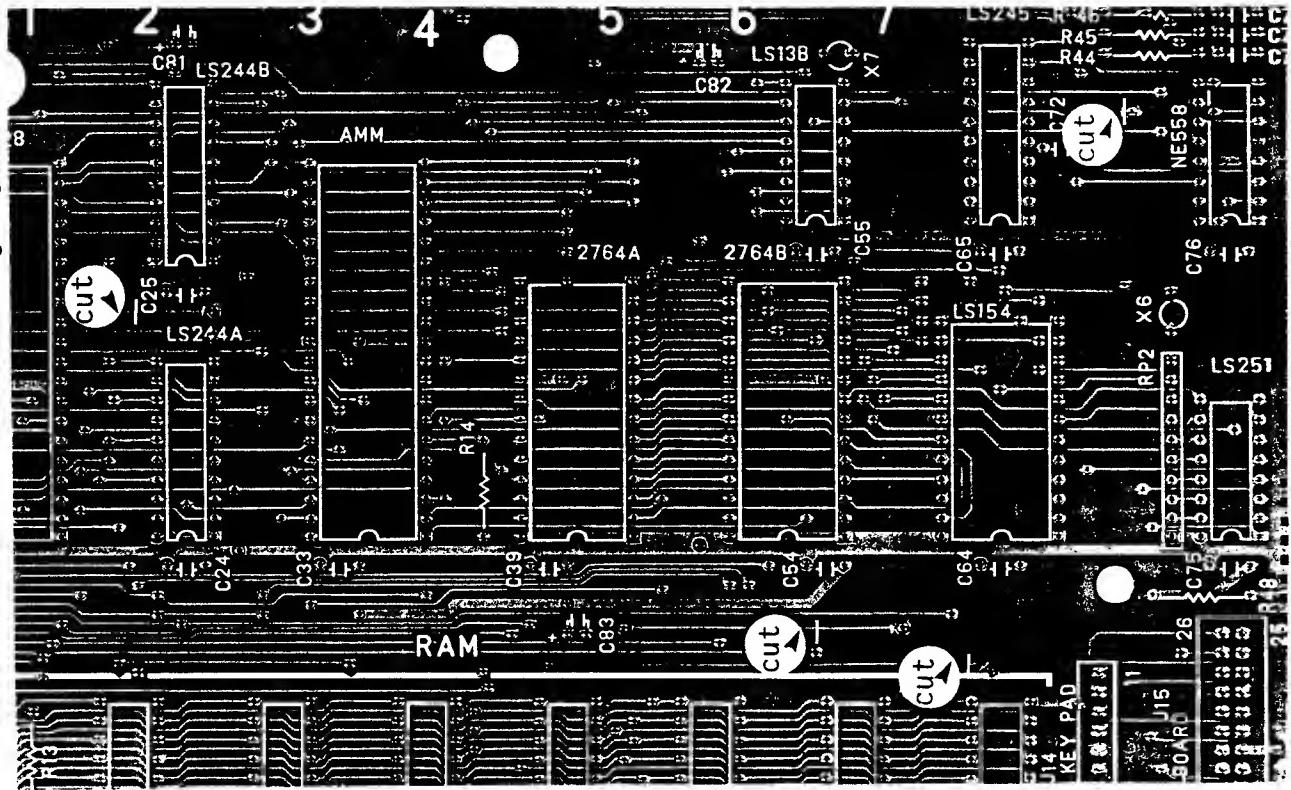
INTEGRATED CIRCUITS (continued)

- 1 - 6502B MPU (or 65C02) @ BC-1
- 1 - 2716 EPROM @ F-8
- 1 - 2732 EPROM @ F-4
- 1 - 2764 EPROM @ C-7
- 1 - 2764 EPROM @ C-9
- 8 - 4164 RAM 200 ns @ Row D
- 1 - AY5-3600-PRO @ EF-10

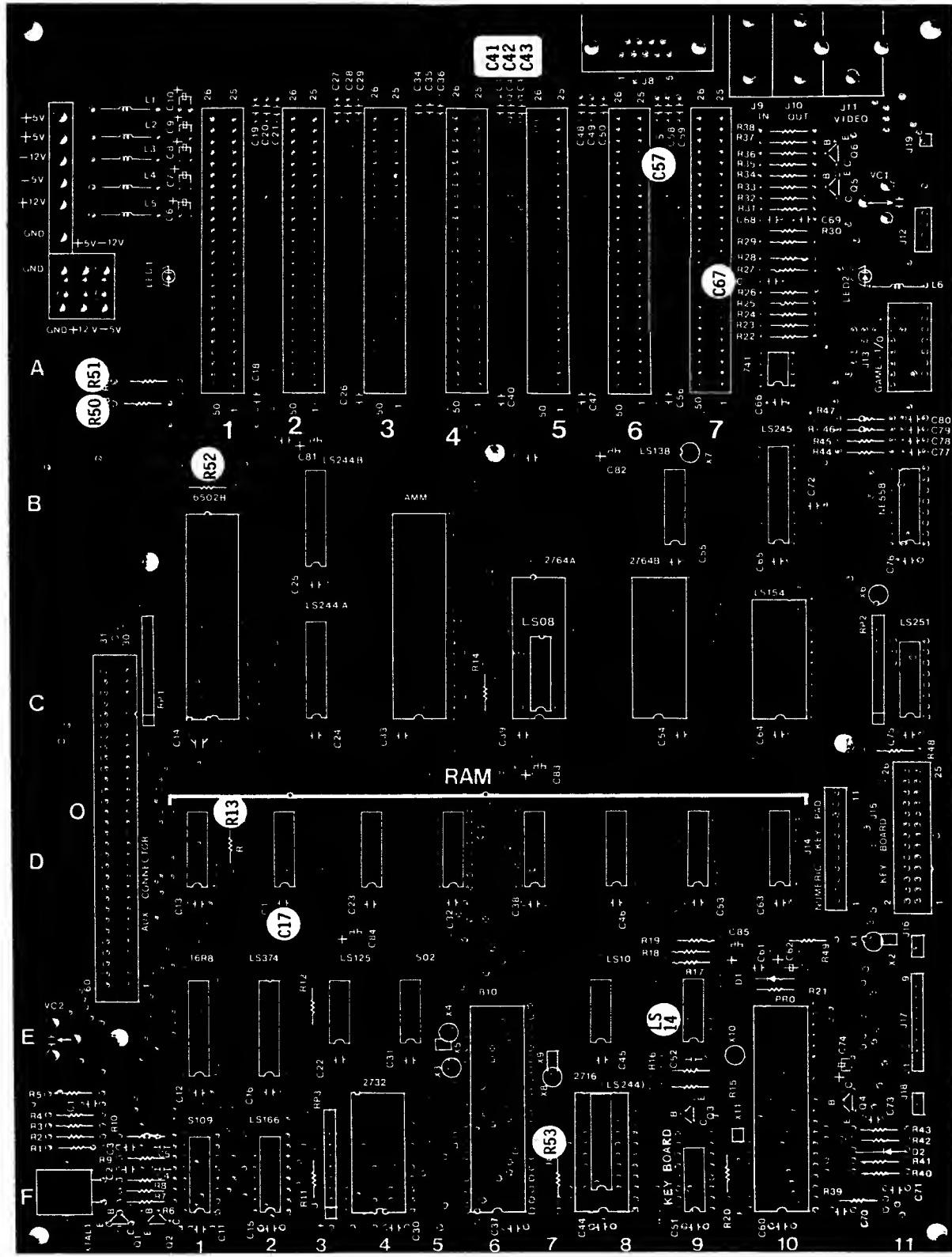
CUSTOM INTEGRATED CIRCUITS

- 1 - STK65371 (or STK50371) @ BC-4
- 1 - STK65301 @ EF-6
- 1 - 16R8 PAL @ E-1

***MODIFICATIONS:** Make four cuts on the COMPONENT SIDE as shown on the following layout:



JK 6502B/65C02 MOTHERBOARD: System board features include: 6502B or 65C02 MPU; 64 K of RAM expandable via the auxiliary slot; eight expansion slots for numerous peripherals (one 60-pin & seven 50-pin slots); colour graphics capability; I/O ports. Requires firmware (one 2716, one 2732 & two 2764 EPROMs), & three specialized ICs. Supports various operating systems and programming languages. Requires modifications.



actual size
29.2 cm x 22.2 cm
(layout is reduced)

B/65C02 MOTHERBOARD:

(continued)

* INDICATES A PRECAUTION

D *Position banded (cathode) end diode towards the arrow	SOCKETS (continued)	LIGHT EMISSITING DIODES D *Position flat part or shorter lead of LED towards the arrow on layout
- 1N914 @ D1,2	5 - 14-pin 14 - 16-pin 3 - 20-pin 5 - 24-pin 2 - 28-pin 4 - 40-pin	2 - LED @ LED1,2
RS R $\frac{1}{4}$ watt, 5% *R51 is 1 watt	CAPACITORS C	HEADERS male, straight
20 is not equipped	2 - 47 pF @ C69,70	1 - 1x4 @ J12 RF converter
- 47 Ω @ R5,13,14	1 - 100 pF @ C68	1 - 1x11 @ J14 Num keypad
- 51 Ω @ R4	4 - 220 pF @ C2,3,4,5	1 - 2x13 @ J15 Keyboard
- 75 Ω @ R38,40	5 - 0.022μF @ C61,77,78,79,80	1 - 1x2 @ J16
- 100 Ω @ R27,36,37,44,45,46,47	61 - 0.1 μF Monolithic @ C1,11 to 60, @ C63,64,65,66,67,71,72, @ C73,75,76	1 - 1x9 @ J17
- 100* Ω @ R51* 1 watt	12 - 10 μF/16V Tantalum* @ C6,7,8,9, @ C10,62,74,81,82,83,84,85	1 - 1x2 @ J18 Speaker
- 120 Ω @ R1,6,8,9,10	*Match + of Tantalums	1 - 1x1 @ J19 Video out
- 150 Ω @ R2	with + on the layout	
- 200 Ω @ R41,50	2 - 50 pF Trimcap @ VC1,2	
- 270 Ω @ R3	TRANSISTORS Q *Match EBC transistor leads	CONNECTORS
- 330 Ω @ R31	with EBC on the layout	1 - 6-pin power @ POWER
- 470 Ω @ R43,48	2 - Audio jacks @ J9,10	
- 1 kΩ @ R7,11,12,29,35,52	1 - RCA phono jack @ J11	
- 2.7 kΩ @ R30	1 - 60-pin card edge connector @ Ø	
- 4.7 kΩ @ R16,53	7 - 50-pin card edge connector @ 1,2,3,4,5,6,7	
- 5.6 kΩ @ R33		
- 6.8 kΩ @ R32,34		
- 10 kΩ @ R17,18,19,21	INTEGRATED CIRCUITS *Match pin 1 of ICs	
- 12 kΩ @ R22,24,25,26,28	with pin 1 on the layout	
- 22 kΩ @ R15	1 - 74LS14 @ Location E-9	
- 47 kΩ @ R49	1 - 74LS10 @ E-8	
- 51 kΩ @ R42	1 - 74LS125 @ E-3	
- 100 kΩ @ R39	1 - 74LS138 @ B-9	
- 1 MΩ @ R23	1 - 74LS154 @ C-10	
	CRYSTAL Y *Fold crystal flat against the board before soldering.	
	1 - 14.31818 MHz @ XTAL1	
	1 - 27 μH @ L6	
	5 - Ferrite bead*, four-hole @ L1,2,3, @ L4,5	
	1 - 74S02 @ E-4	
	1 - 74S109 @ F-1	
	1 - NE558 @ B-11	
	1 - 741 @ A-10	
	pin 1 of the following SIPs passed) with pin 1 (square pad) the layout	
- 1 kΩ 10-pin SIP @ RP2		
- 4.7 kΩ 10-pin SIP @ RP1,3		
	*Match pin 1 of sockets with 1 on the layout. Check that pins have passed thru ALL holes 8-pin	

6502B/65C02 MOTHERBOARD (continued)

INTEGRATED CIRCUITS (continued)

- 1 - 6502B MPU (or 65C02) @ BC-1
- 1 - 2716 EPROM @ F-8 *74LS244 NOT required
- 1 - 2732 EPROM @ F-4
- 1 - 2764 EPEOM @ C-7
- 1 - 2764 EPEOM @ C-9 *74LS08 NOT required
- 1 - 2764 EPEOM @ C-9
- 8 - 4164 RAM 200 ns @ Row D
- 1 - AY5-3600-PRO @ EF-10

STOM INTEGRATED CIRCUITS

- 1 - STK65371 (or STK50371) @ BC-4
- 1 - STK65301 @ EF-6
- 1 - 16R8 PAL @ E-1

NOTIFICATIONS

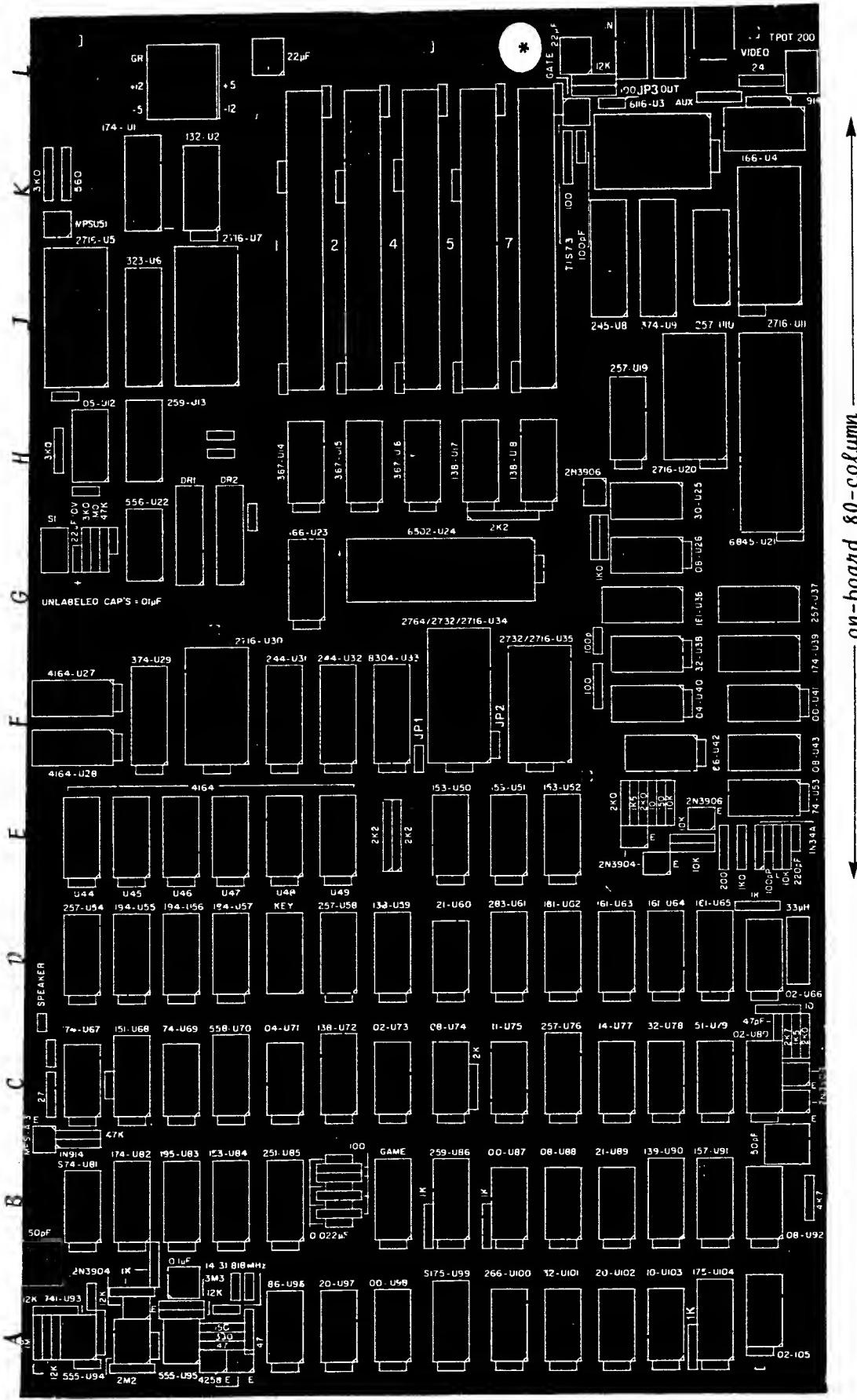
- cut split circle open @ X10 (E-10)
- cut bowtie open @ X11 (E-10)

GUIDE SB-3

SURF BOARD MONTIERBOARD

► on-board 64 K RAM

►on-board disc drive controller



A Fig. 2-16. A COPY OF THE COMPONENT SIDE OF THE SURF-BOARD PCB (REDUCED IN SIZE) SHOWING THE COMPONENT LAYOUT. SOME OF THE UNIQUE FEATURES OF THE SURF-BOARD NOT NORMALLY FOUND ON OTHER SIMILAR PERSONAL COMPUTERS INCLUDE: 64 K BYTES OF USER MEMORY, DUAL DISC DRIVE CONTROLLER; 80-COLUMN TEXT DISPLAY WITH UPPER/LOWER CASE, AS WELL AS HIGH/LOW RESOLUTION COLOUR GRAPHICS, FIVE EXPANSION SLOTS, CASSETTE AND JOYSTICK IN/OUTPUTS, ETC.

B SURF-BOARD PARTS LIST

RESISTORS R, $\frac{1}{4}$ watt, 5%

— 2 - 10 Ω	— 1 - 560 Ω	— 6 - 12 K Ω
— 1 - 24 Ω	— 9 - 1 K Ω	— 2 - 47 K Ω
— 1 - 27 Ω	— 2 - 1.5 K Ω	— 2 - 1 M Ω
— 2 - 47 Ω	— 4 - 2 K Ω	— 1 - 2.2 M Ω
— 7 - 100 Ω	— 1 - 2.7 K Ω	— 1 - 3.3 M Ω
— 2 - 150 Ω	— 3 - 3 K Ω	— 3 - 2.2 K Ω x 8 SIP
— 1 - 200 Ω	— 1 - 4.7 K Ω	— 1 - 200 Ω Trimpot
— 1 - 330 Ω	— 5 - 10 K Ω	

DIODES D

— 2 - IN914	COIL L	CRYSTAL Y
— 1 - IN34A or IN270	— 1 - 33 μ Hz	— 1 - 14.31818 MHz

CAPACITORS C

— 1 - 47 pF	TRANSISTORS Q
— 3 - 100 pF	— 5 - 2N3904
— 1 - 220 pF	— 2 - 2N3906
I16 - 0.1 μ F	— 2 - 2N4258
— 3 - 22 μ F Tantalum	— 1 - MPSA13
— 2 - 50 pF Trimcap	— 1 - MPSU51
— 4 - 0.02 μ F/10v Tantalum	— 1 - TIS73 (FET)

INTEGRATED CIRCUITS IC

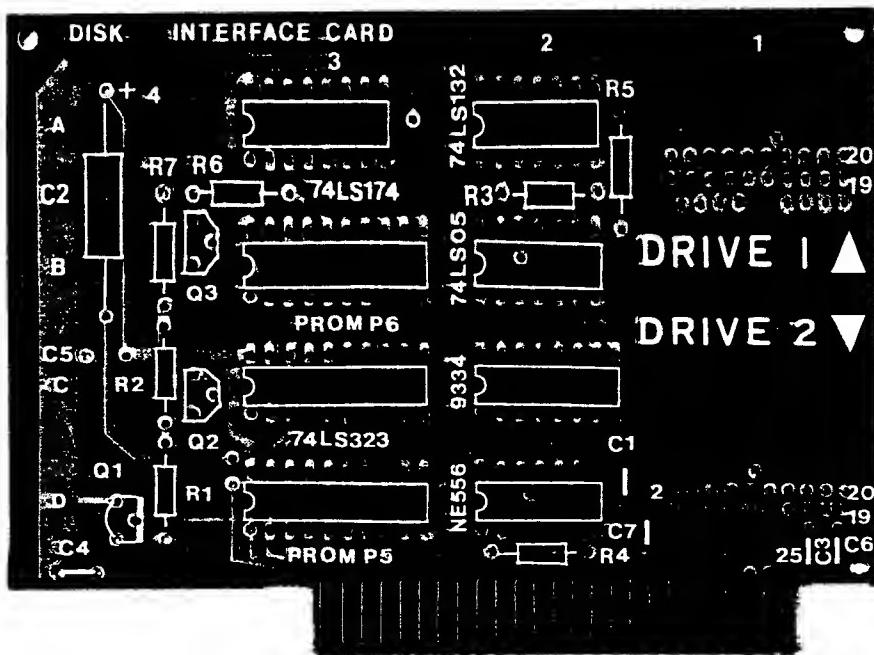
TTL 74LSxxx ICs	TTL 74LSxxx ICs (cont)	TTL BUFFER IC
— 3 - 74LS00 @ U41,87,98	— 2 - 74LS166 @ U4,23	— 1 - 8304 @ U33
— 4 - 74LS02 @ U66,73,105, U80	— 3 - 74LS174 @ U1,39,82	
— 2 - 74LS04 @ U40,71	— 1 - 74LS175 @ U104	
— 1 - 74LS05 @ U12	— 3 - 74LS194 @ U55,56,57,	
— 5 - 74LS08 @ U26,43,74, U88,92	— 1 - 74LS195 @ U83	
— 1 - 74LS10 @ U103	— 2 - 74LS244 @ U31,32	
— 1 - 74LS11 @ U75	— 1 - 74LS245 @ U8	
— 1 - 74LS14 @ U77	— 1 - 74LS251 @ U85	
— 2 - 74LS20 @ U97,102	— 6 - 74LS257 @ U10,19,37, U54,58,76	
— 2 - 74LS21 @ U60,89	— 2 - 74LS259 @ U13,86	
— 1 - 74LS30 @ U25	— 1 - 74LS266 @ U100	
— 3 - 74LS32 @ U38,78,101	— 1 - 74LS283 @ U61	
— 1 - 74LS51 @ U79	— 1 - 74LS323 @ U6	
— 3 - 74LS74 @ U53,67,69	— 3 - 74LS367 @ U14,15,16	
— 2 - 74LS86 @ U42,69	— 2 - 74LS374 @ U9,29	
— 1 - 74LS132 @ U2	TTL 74Sxxx ICs	
— 4 - 74LS138 @ U17,18,59, U72	— 1 - 74S74 @ U81	
— 1 - 74LS139 @ U90	— 1 - 74S175 @ U99	
— 1 - 74LS151 @ U68	LINEAR ICs	
— 4 - 74LS153 @ U50,51,52, U84	— 2 - LM555 @ U94,95	
— 1 - 74LS157 @ U91	— 1 - LM741 @ U93	
— 5 - 74LS161 @ U36,62...65	— 1 - NE556 @ U22	
	— 1 - NE558 @ U70	

ACCESSORIES

— 1 - "Surf-Board" motherboard	— 2 - 2x10 male header strip (straight)
— 1 - RCA video jack (PCB mount)	— 1 - 1x16 male header strip (straight)
— 2 - audio jacks (PCB mount)	— 1 - ABS keyboard case

GUIDE 1-1

DISK CONTROLLER CARD: Allows one to interface one or two disk drives with the microcomputer. With power off, install in slot number 6. (TWO DRIVES) Requires firmware (two PROMS).



↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑

*Position header pins of
DRIVE 1 and DRIVE 2 UP.

↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑

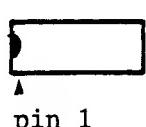
SEQUENCE * INDICATES A PRECAUTION

RESISTORS	R	$\frac{1}{4}$	watt,	5%
—	1 - 68	Ω	@ R2	
—	1 - 150	Ω	@ R1	
—	1 - 560	Ω	@ R6	
—	2 - 3	K Ω	@ R3, 7	
—	1 - 47	K Ω	@ R5	
—	1 - 1	M Ω	@ R4	

CAPACITORS C
— 6 - 0.1 μ F @ C1,3,4,5,6
— 1 - 22 μ F/25v axial* @

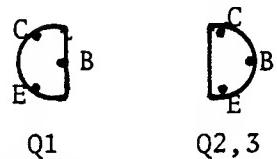
SOCKETS *Match pin 1 of sockets with pin 1
on the layout. Check that ALL
pins of sockets have passed thru
ALL holes

3 - 14-pin
 2 - 16-pin
 3 - 20-pin



TRANSISTORS Q *Install 3 leads as shown
 — 1 - 2N3906 @ Q1
 — 2 - MPSU51 @ Q2,3





*Check with supplier re
EBC leads of transistors

CONNECTORS *Connector pins must be positioned
UP as shown by ↑↑↑↑↑↑↑
2 - 2X10 male header strip, right angles

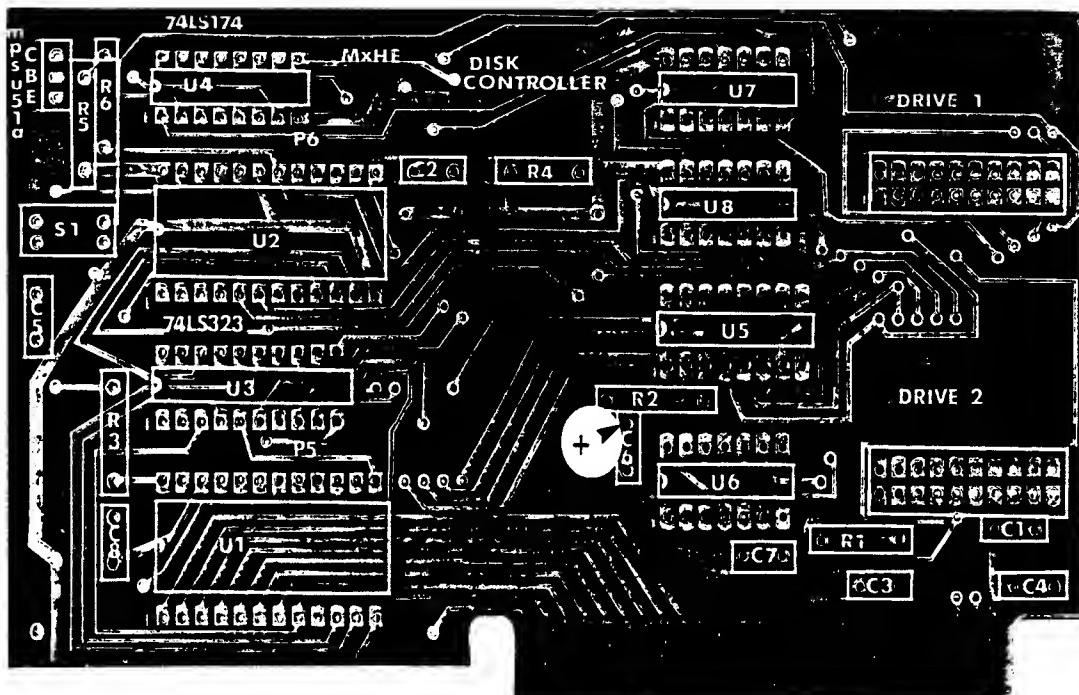
INTEGRATED CIRCUITS *Match pin 1 of IC
with pin 1 on layout

1 -	74LS05	
1 -	74LS174	
1 -	74LS132	▲ pin 1 lower left for
1 -	74LS323	ALL sockets
1 -	9334 (74LS259)	& ICs
1 -	NE556	
2 -	6309 PROMs @ P5.6	



GUIDE 1-2

APL-DISK CONTROLLER CARD: Allows user to interface one or two disk drives with the computer. With power off, install in slot number 6. Requires firmware (two EPROMS). Switch-selectable for DOS 3.2 or 3.3.



Position connector
pins of drive 1 & 2
UP

SUGGESTED SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 560 Ω @ R6
- 3 - 3 K Ω @ R3,4,5
- 1 - 47 K Ω @ R2
- 1 - 1 M Ω @ R1

SOCKETS *Match pin 1 of sockets with pin 1 on the layout

- 3 - 14-pin
- 2 - 16-pin
- 1 - 20-pin
- 2 - 24-pin

CAPACITORS C

- 7 - 0.1 μ F Monolithic @ C1,2,3,4,5,
C7,8
- 1 - 22 μ F/25V radial* @ C6
*Match + of capacitor
with + on the layout

TRANSISTOR Q *Position EBC leads as shown on the layout

- 1 - MPSU51A

SWITCH

- 1 - SPST PCB mount @ S1

CONNECTORS *Position connector pins UP as shown on the layout

- 2 - 2x10 male header strip, right angle

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

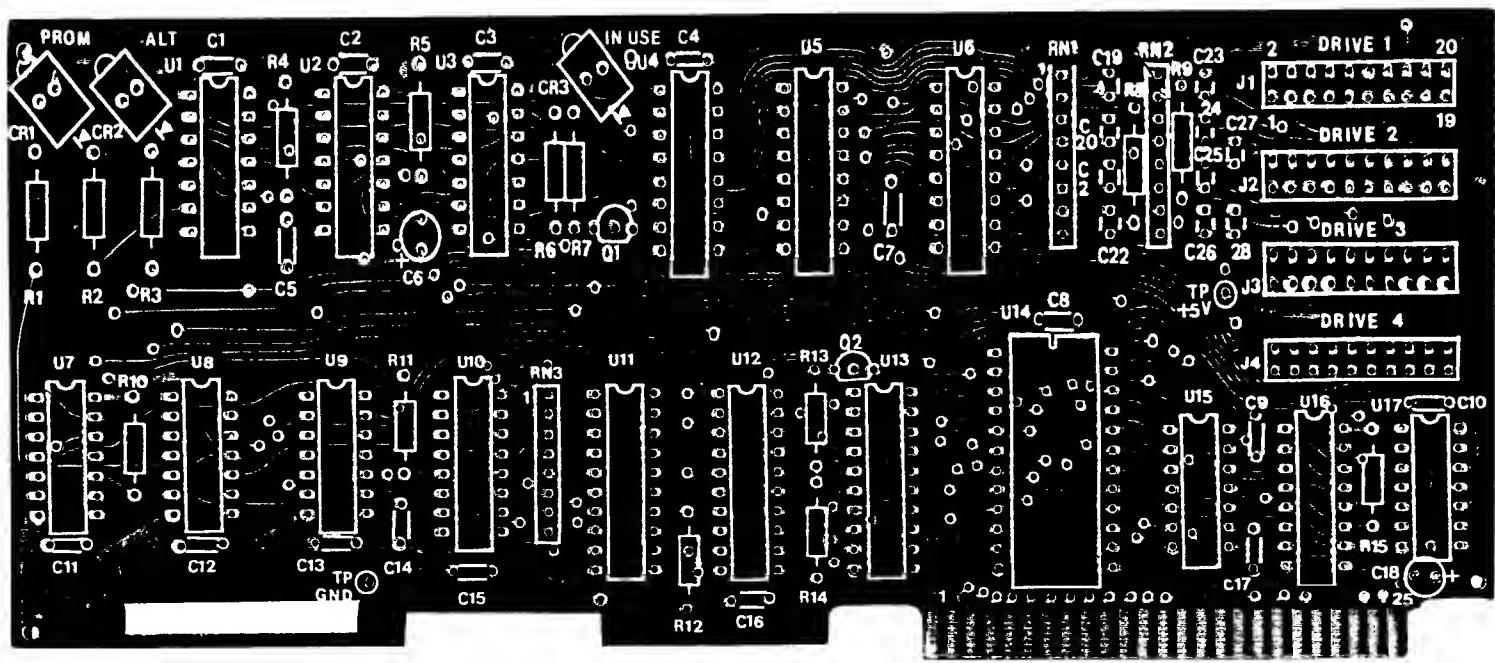
- 1 - 2716 EPROM 350 ns @ U1 (P5)
- 1 - 2716 EPROM 350 ns @ U2 (P6)
- 1 - 74LS323 @ U3
- 1 - 74LS174 @ U4
- 1 - 74LS259 @ U5
- 1 - 556 @ U6
- 1 - 74LS132 @ U7
- 1 - 74LS05 @ U8

pin 1
lower left for
ALL sockets
& ICs



GUIDE 1-3

QUAD DRIVE CARD: Controls from one to four minifloppy disk drives. Automatically boots DOS 3.2 or 3.3, 13 or 16-sector. Requires software (one disk) and firmware (one PROM and one EPROM). With power off, install in slot 6.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 2 - 33 Ω @ R8,9
- 1 - 100 Ω @ R11
- 1 - 470 Ω @ R12
- 6 - 680 Ω @ R1,2,6,7,13,14
- 1 - 4.7 K Ω @ R15
- 1 - 47 K Ω @ R5
- 1 - 1 M Ω @ R4
- 2 - 4S33 Ω SIP* (isolated) @ RN1,2
- 1 - 4.7 K Ω SIP* (bussed) @ RN3

*Match pin 1 (common) of SIP with pin 1 on the layout

SOCKETS *Match pin 1 of sockets with pin 1

- 8 - 14-pin on the layout
- 5 - 16-pin (upper left for
- 3 - 20-pin ALL SOCKETS)
- 1 - 24-pin

CAPACITORS C

- 1 - 180 pF @ C14
 - 10 - 0.001 μ F Monolithic @ C19,20,21, C22,23,24,25,26,27,28
 - 15 - 0.1 μ F Monolithic @ C1,2,3,4, C5,7,8,9,10,11,12,13, C15,16,17
 - 1 - 4.7 μ F/50v Radial* @ C18
 - 1 - 22 μ F/16v Radial* @ C6
- *Match + of capacitor with + on the layout

TRANSISTORS Q *Install the three EBC leads as shown

- 2 - 2N3906 @ Q1,2



DIODES D

- 3 - LED *Position longer lead (anode) of LEDs as shown @ CR1,2,3



CONNECTORS

- 4 - 2x10 male header strip, straight

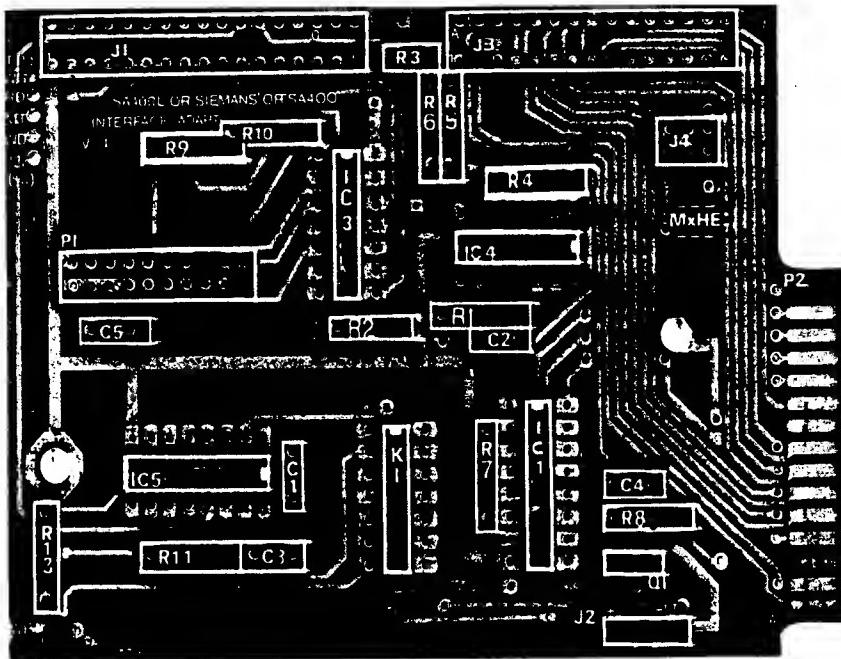
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on layout

- 1 - 74LS00 @ U9
- 1 - 74LS02 @ U17 pin 1 →
- 1 - 74LS05 @ U3 upper left
- 1 - 74LS08 @ U8 for ALL ICs
- 1 - 74LS30 @ U15 & SOCKETS
- 2 - 74LS74 @ U1,7
- 1 - 74LS138 @ U4
- 1 - 74LS174 @ U10
- 1 - 74LS257 @ U16
- 1 - 74LS259 @ U6
- 1 - 74LS323 @ U12
- 1 - 74LS367 @ U5
- 1 - NE556 @ U2
- 1 - DP8304 @ U13
- 1 - 2716 EPROM @ U14
- 1 - 7649A-5 PROM @ U11



GUIDE 1-4

SHUGART DISK DRIVE INTERFACE ADAPTER CARD: Install in SA400L disk drive to interface drive with disk controller card of computer. Schematics available from supplier.



SEQUENCE * INDICATES A PRECUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

*R3 & R12 are not equipped

- 1 - 330 Ω @ R8
 1 - 560 Ω @ R7
 1 - 1.5 K Ω @ R11
 6 - 3 K Ω @ R1,2,4,5,6,13
 *Mount R9 & R10 on the SOLDER SIDE
 2 - 3 K Ω @ R9,10

SOCKETS * Match pin 1 of sockets with pin 1
on the layout. Check that ALL pins
have passed thru ALL holes

CAPACITORS C

- 2 - 330 pF @ C2,3
— 3 - 0.1 F Monolithic @ C1,4,5

TRANSISTOR Q *Match EBC transistor leads
with EBC on the layout

1 - MPSU51 @ Q1

CONNECTORS *J4 is not equipped

- 1 - 1x4 header, male, straight @ J2



+5 GND +12

*Mount the following connectors on the
SOLDER SIDE

- 1 - 34-pin card edge connector @ J1

INTEGRATED CIRCUITS *Match pin 1 of ICs
with pin 1 on the layout

- 1 - ULN2003 (Sprague) @ IC1
— 1 - 74LS125 @ IC3

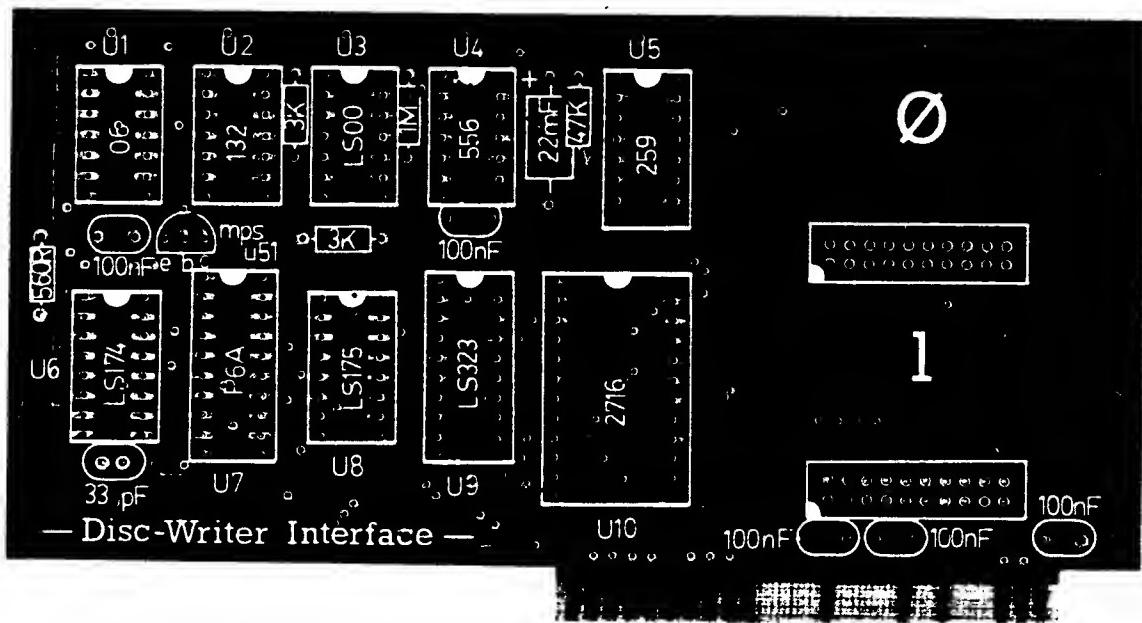
1 - 74LS86 @ IC4
1 - 74LS123 @ IC5

TESTS & RESULTS



GUIDE 1-5

DISK-WRITER INTERFACE CARD: Allows user to run one or two 5 $\frac{1}{4}$ " floppy disk drives. Automatically boots 13 or 16-sector diskettes. With power off, install in slot number 6. Requires firmware (one PROM and one EPROM).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 560 Ω
- 2 - 3 K Ω
- 1 - 47 K Ω
- 1 - 1 M Ω

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 4 - 14-pin
- 3 - 16-pin
- 2 - 20-pin
- 1 - 24-pin

CAPACITORS C

- 1 - 33 pF
- 5 - 0.1 μ F Monolithic @ 100 nF
- 1 - 22 μ F/16V Axial* @ 22 mF

*Match + of Axial with + on the layout

TRANSISTOR Q *Position the EBC leads as shown on the layout

- 1 - 2N3904 @ MPSU51

CONNECTORS

- 2 - 2x10 male header, right angles*

*Position header pins UP

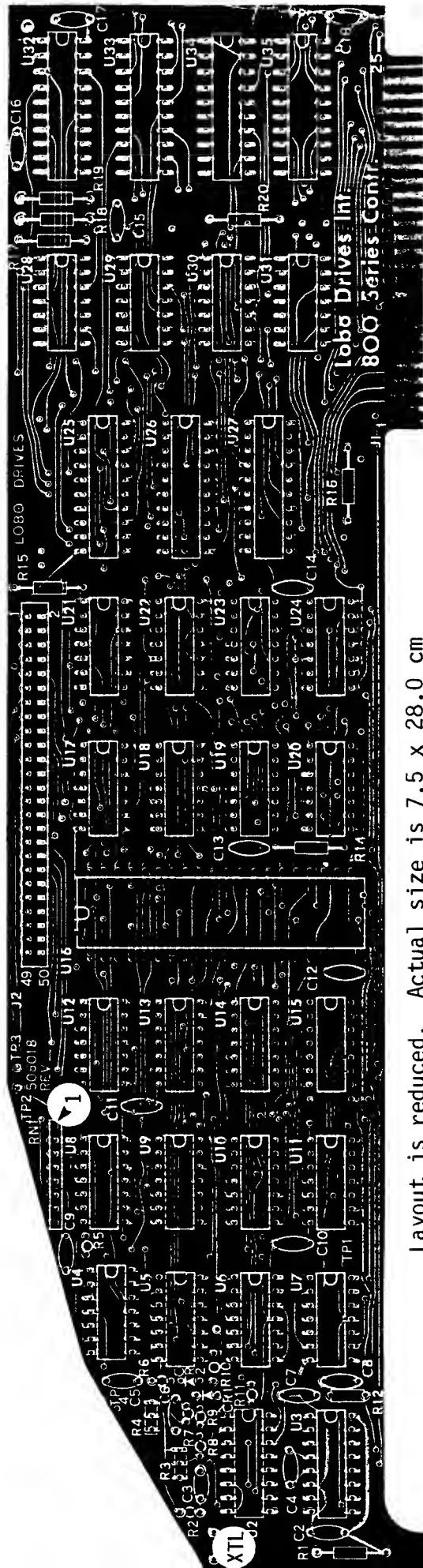
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 7406 @ U1
- 1 - 74132 @ U2
- 1 - 74259 @ U5
- 1 - 74LS00 @ U3
- 1 - 74LS174 @ U6
- 1 - 74LS175 @ U8
- 1 - 74LS323 @ U9
- 1 - NE556 @ U4
- 1 - 2716 EPROM @ U10
- 1 - 68F5 (P6A) PROM @ U7



GUIDE 1-6

8-INCH FLOPPY DISK CONTROLLER CARD: Increases memory storage capacity by allowing user to interface up to four standard 8" single or double-sided, double-density floppy disk drives with the computer. Allows access to standard 8" CP/M disk with appropriate CP/M card installed & software. Documentation & schematics are available from the supplier. Requires firmware (one EPROM) & software (one disk).



Layout is reduced. Actual size is 7.5 x 28.0 cm

SUGGESTED SEQUENCE

*INDICATES A PRECAUTION
DIODES D *Position banded end of diode towards the arrow

2 - 1N4148 @ CR1†, CR2†

RESISTORS R $\frac{1}{4}$ watt, 5% *R13 is not equipped

2 - 200 Ω @ R6†, R10†

1 - 330 Ω @ R14

4 - 1 k Ω @ R5†, R11†, R18, R19

1 - 2.2 k Ω @ R16

1 - 2.7 k Ω @ R7†

4 - 4.7 k Ω @ R1, R12†, R15, R20

1 - 5.6 k Ω @ R2†

1 - 10 k Ω @ R17

1 - 15 k Ω @ R9†

1 - 100 k Ω @ R8†

1 - 150 Ω 8-pin SIP* bussed @ RN1

*Match pin 1 of SIP with pin 1 on the layout

2 - 5 k Ω Trimpot @ R3, 4

10-turn recommended

*INSTALL COMPONENTS LABELLED † ON THEIR ENDS

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

pin 1

23 - 14-pin

3 - 16-pin

7 - 20-pin

1 - 40-pin

CAPACITORS C *C1 is not equipped

1 - 68 pF @ C3

1 - 100 pF @ C13

2 - 150 pF @ C7, 8

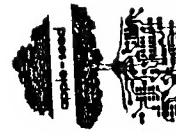
1 - 200 pF Silver Mica @ C4**

1 - 0.001 μ F @ C5

1 - 0.01 μ F @ C6

10 - 0.1 μ F Monolithic @ C2, 9, 10, 11
C12, 14, 15, 16, 17, 18

(continued)



-INCH FLOPPY DISK CONTROLLER CARD (continued)

INTEGRATED CIRCUITS *Match pin 1 of ICs
with pin 1 on the layout

U1 is not equipped

— 1 - 74LS00 @ U11

— 1 - 74LS02 @ U9

— 2 - 74LS04 @ U4,10

— 2 - 74LS07 @ U12,20

— 1 - 74LS08 @ U18

— 2 - 74LS14 @ U8,24

— 5 - 74LS32 @ U14,17,19,22,23

— 4 - 74LS74 @ U5,6,7,21

— 1 - 74LS123 @ U2

— 1 - 74LS175 @ U15

— 4 - 74LS177 or 74LS197
@ U28,29,30,31

— 2 - 74LS240 @ U33,34

— 2 - 74LS244 @ U26,27

— 1 - 74LS273 @ U32

— 1 - 74LS373 @ U35

— 1 - 7438 @ U13

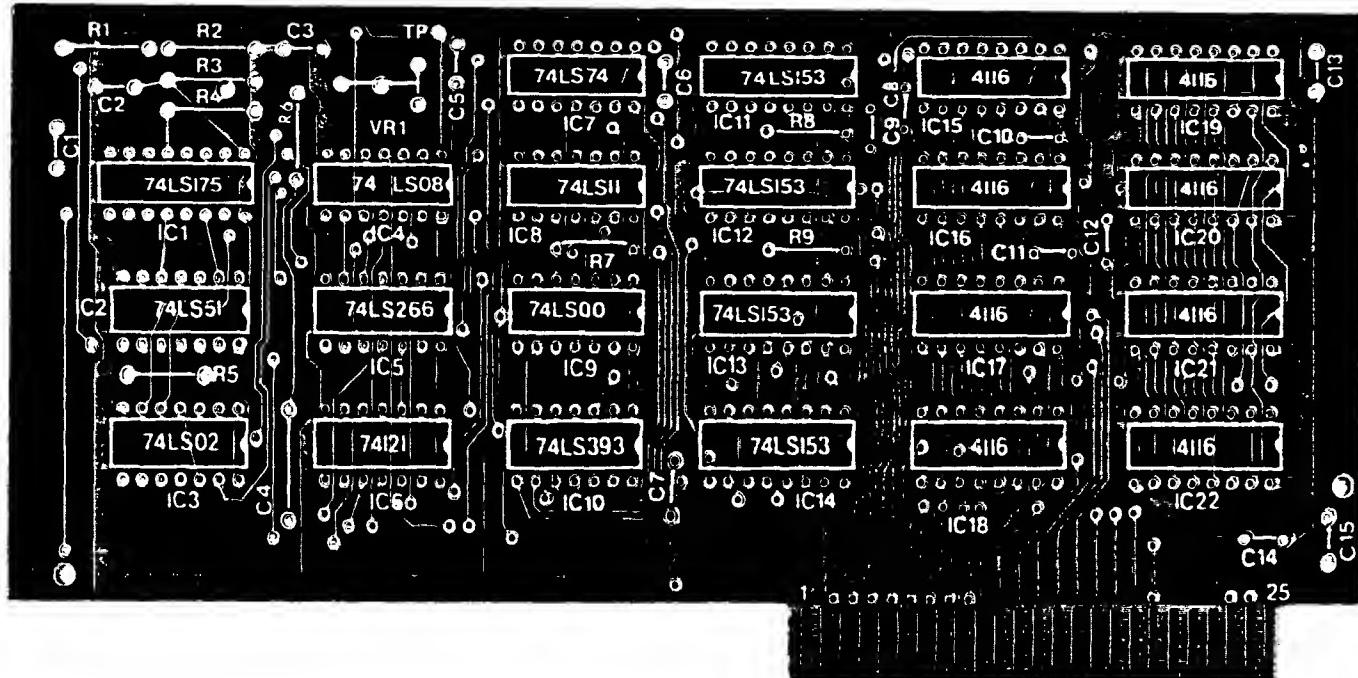
— 1 - 74124 @ U3 Substitutes:
74LS124 - use 130 pF @ C4**
74S124 - use 330 pF @ C4**

— 1 - MB8866 or MB8876 (Fujitsu)
or WD1791 (Western Digital) @ U16

— 1 - 28S42 (T.I.) 512x8 PROM
@ U25

GUIDE 2-1

16 K RAM CARD: Expands the capabilities of your system by increasing its internal memory to 64 K of RAM memory. With power off, install in slot 0.



SEQUENCE *INDICATES A PRECAUTION

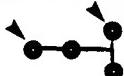
RESISTORS R $\frac{1}{4}$ watt, 5%

— 4 - 2.7 K Ω @ R1,2,3,5

— 5 - 1 K Ω @ R4,6,7,8,9

— 1 - 2.2 K Ω @ VR1*

*Position this resistor
as shown by arrows



CAPACITORS C

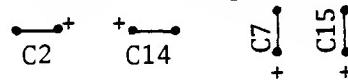
— 1 - 68 pF @ C1

— 9 - 0.1 μ F @ C3,5,6,8,9,10,11,12,13

— 1 - 100 pF @ C4

— 4 - 15 μ F/16v Tantalum* @ C2,7,14,15

*Match + of capacitors as shown



SOCKETS *Match pin 1 of sockets with pin 1
on the layout. Check that ALL
pins have passed thru ALL holes

— 9 - 14-pin

pin 1

— 13 - 16-pin



INTEGRATED CIRCUITS *Match pin 1 of IC
with pin 1 on layout

— 1 - 74LS00 @ IC9

— 1 - 74LS02 @ IC3

— 1 - 74LS08 @ IC4

— 1 - 74LS11 @ IC8

— 1 - 74LS51 @ IC2

— 1 - 74LS74 (Hitachi) @ IC7

— 1 - 74LS175 @ IC1

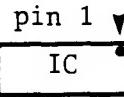
— 1 - 74LS266 @ IC5

— 1 - 74LS393 @ IC10

— 1 - 74LS121 @ IC6

— 4 - 74LS153 @ IC11,12,13,14

— 8 - 4116 RAM (TI) @ IC15,16,17,18,19,
IC20,21,22

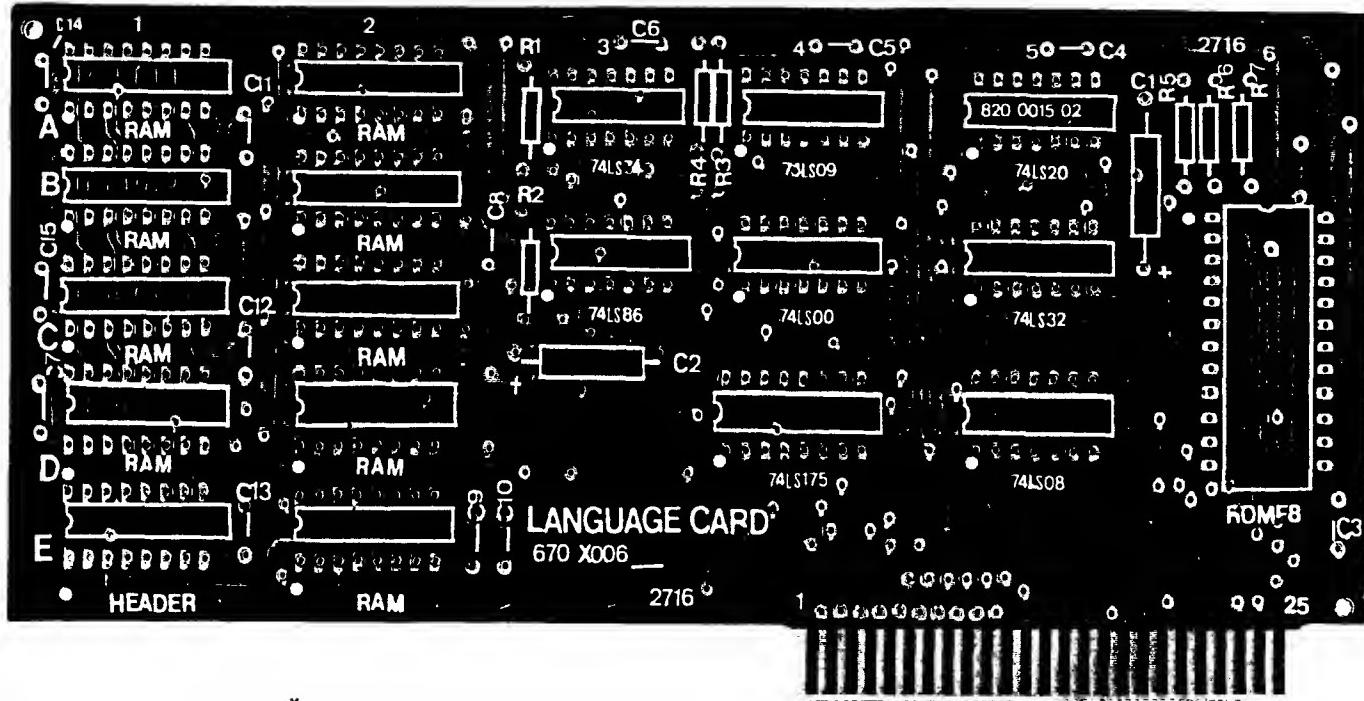


pin 1



GUIDE 2-3

LANGUAGE CARD: Adds an additional 16 K of dynamic RAM memory to the 48 K on board. Can be used to hold a second language or as transient space for CP/M. With power off, install in slot number 0. Requires F8 ROM from motherboard on the card.



SEQUENCE

*INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%
 _____ 5 - 3 K @ R1,2,3,5,6
 _____ 2 - 1 K @ R4,7

CAPACITORS C

_____ 2 - 10 μ F/25v axial* @ C1,2
 _____ 1 - 10 μ F/25v Tantalum* @ C3
 _____ 12 - 0.1 μ F @ C4 to 15
 *Match + of capacitor to + on
 the layout

SOCKETS *Match pin 1 of sockets with pin 1
 (white dot) on the layout. Check
 that ALL pins have passed thru
 ALL holes

_____ 7 - 14-pin
 _____ 11 - 16-pin
 _____ 1 - 24-pin

pin 1

INTEGRATED CIRCUITS *Match pin 1 of ICs
 with pin 1 (white dot)

_____ 1 - 74LS00
 _____ 1 - 74LS08
 _____ 1 - 74LS09
 _____ 1 - 74LS20
 _____ 1 - 74LS32
 _____ 1 - 74LS74
 _____ 1 - 74LS86
 _____ 1 - 74LS175
 _____ 9 - 4116 RAM
 _____ 1 - F8 ROM from motherboard installed
 on the card @ ROMF8

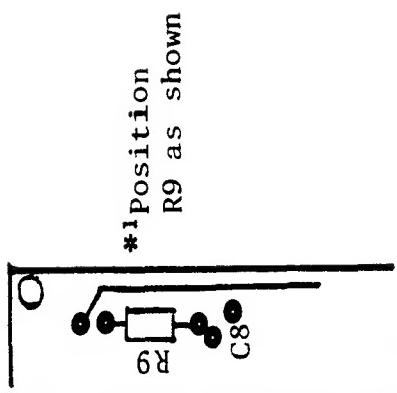
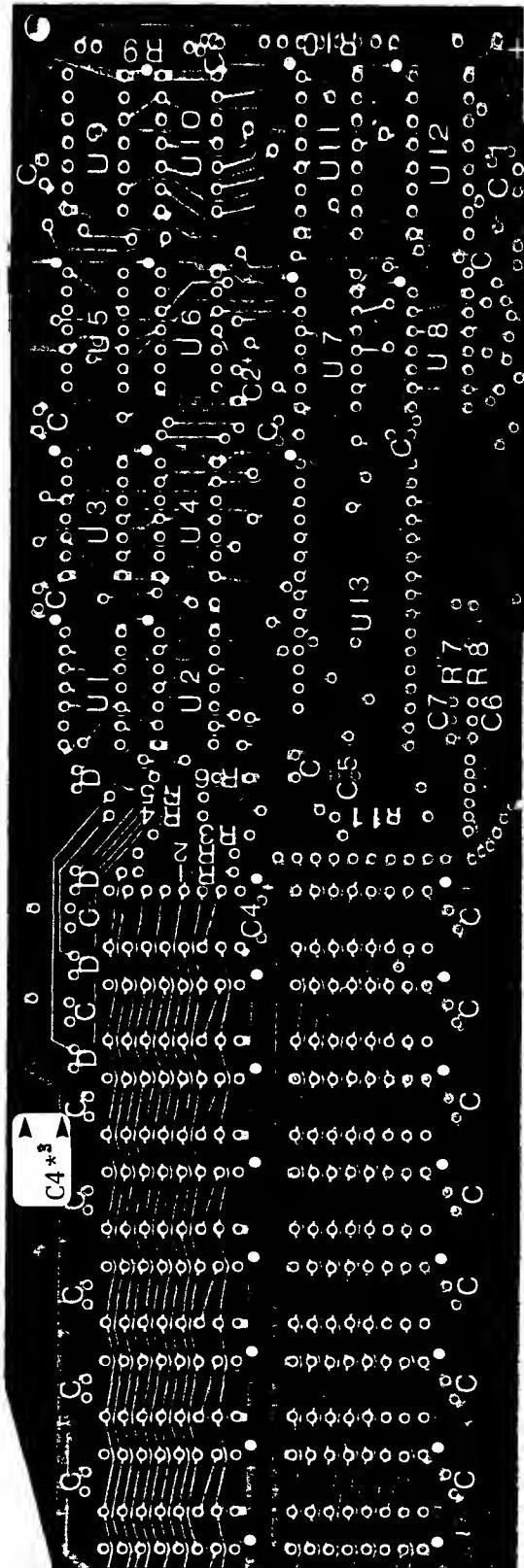
RIBBON CABLE (10-15 cm long)

_____ 1 - 16 pin DIP header

*With POWER OFF connect as follows:
 Remove one 4116 RAM IC from location
 E3 of motherboard (extreme upper
 left corner). Connect ribbon cable
 from location E1 of language card
 to E3 of motherboard. MATCH pin 1
 of card to pin 1 of motherboard.



K RAMCARD: Allows the user to expand the on-board 48K RAM memory by 64K or 128K bytes. With power off, install in slot number 8. Requires software (three disks).



C4*¹ Some cards may have C4 positioned as shown on layout

* INDICATES A PRECAUTION

CAPACITORS C
24 - 0.1 μ F Monolithic @ positions C*²
4 - 22 pF Monolithic @ C5, 6, 7, 8
2 - 2.2 μ F/25V Tantalum* @ C2, C4*³
1 - 10 μ F/25V Axial* @ C1

*Match + of capacitors with

+ on the layout

MODIFICATION *Strap (if required) the two feed-thru holes directly above pins 19 & 20 @ J as shown on the layout

LIGHT EMITTING DIODE D

4 - LEDs at locations labelled D

*Match + of diode with + on layout

TS *Match pin 1 of sockets with white "dot" on layout. Check that ALL pins have passed thru ALL holes

10 - 14-pin

18 - 16-pin

1 - 28-pin

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 (white dot) on the layout

1 - 74LS00 @ U9
1 - 74LS02 @ U8
•pin 1

1 - 74LS08 @ U10
2 - 74LS51 @ U11, 2

1 - 74LS74 @ U6

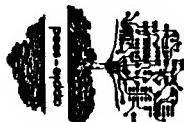
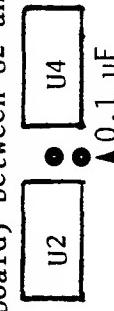
1 - 74LS93 @ U5
1 - 74LS107 @ U4

2 - 74LS175 @ U11, 12

1 - 74LS260 @ U3
1 - MC3242AP @ U13

16 - TMS4164 RAM (or equivalent)

*For 64 K bytes of additional RAM install eight 4164s along the top row; for 128 K, use both rows

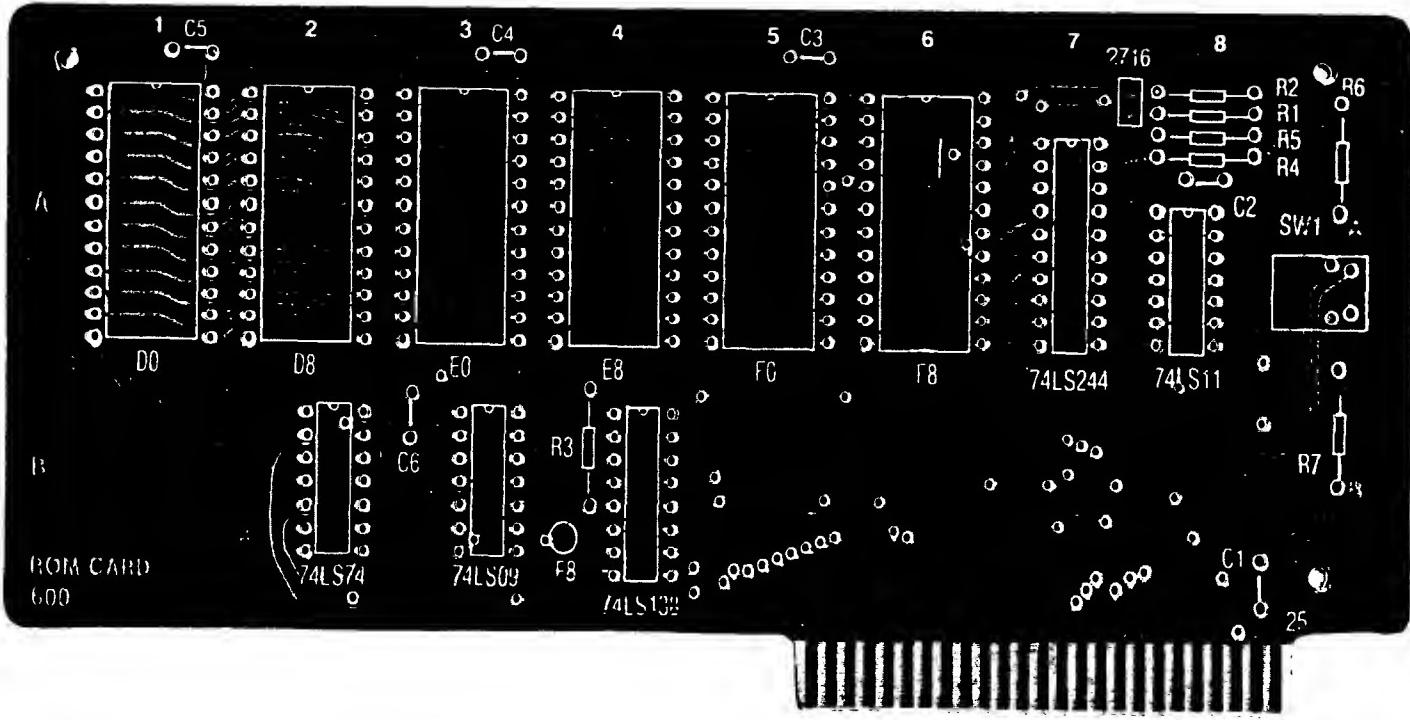


Refer to the APPLE-SEED by Raymond Kosmic for complete assembly instructions.

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GUIDE 2-5

ROM INTEGER CARD: Allows an extra 16K of ROM to be switched in and out of memory in place of on-board ROM. With power off, install in slot number 0. Requires firmware (EPROMS).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%
 _____ 5 - 2.7 K Ω @ R1,2,3,4,5
 _____ 2 - 10 K Ω @ R6,7

CAPACITORS C

_____ 6 - 0.1 μ F @ C1,2,3,4,5,6

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins of sockets have passed thru ALL holes

_____ 3 - 14-pin pin 1 ► 
 _____ 1 - 16-pin
 _____ 1 - 20-pin
 _____ 6 - 24-pin

SWITCH

_____ 1 - single-pole, double-throw @ SW1

INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 on layout

*To use five 2716 EPROMs, jumper at a and b as shown (between 7 and 8)

_____ 1 - 74LS09 _____ 1 - 74LS11 _____ 1 - 74LS74 _____ 1 - 74LS138 _____ 1 - 74LS244 _____ 6 - 2716 EPROMs @ D0,D8,E0,E8,F0,F8	7 8 
--	---

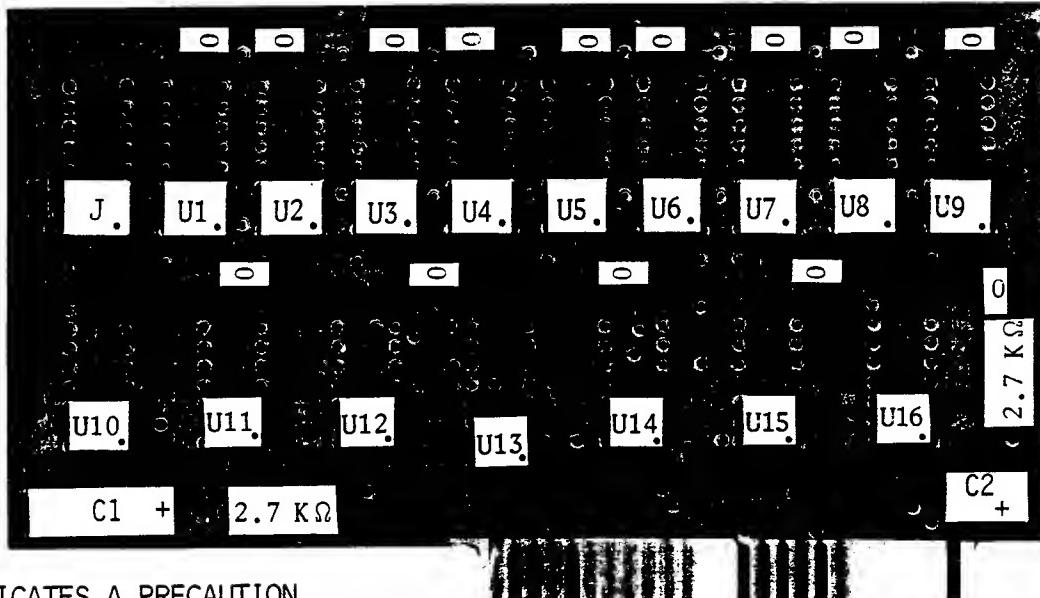
pin 1 ►
 upper left for
 ALL sockets
 & ICs 



NuScope Associates

GUIDE 2-6

16 K RAM CARD: Enhances the power of the computer by increasing the on-board 48 K of RAM to 64 K. Can be used to hold a second language or as a transient space for CP/M. With power off, install in slot number 0.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%
— 2 - 2.7 KΩ

SOCKETS *Match pin 1 of sockets with pin 1 (dot) on the layout. Check that ALL pins have passed thru ALL holes
— 6 - 14-pin
— 11 - 16-pin



pin 1 lower right for ALL sockets

CAPACITORS C

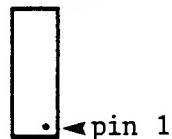
— 14 - 0.1 μF Monolithic @ C0
— 1 - 10 μF/16V Axial* @ C1
— 1 - 10 μF/16V Radial* @ C2
*Match + of TWO electrolytic capacitors with + on the layout

RIBBON CABLE

— 1 - 10-15 cm length of 16-conductor ribbon cable with one 16-pin DIP header at each end

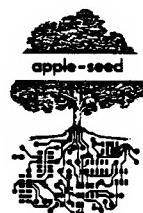
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 (dot) on the layout

- 9 - 4116 RAM @ U1,2,3,4,5,6,7,8,9
- 1 - 74LS74 @ U10
- 1 - 74LS00 @ U11
- 1 - 74LS08 @ U12
- 1 - 74LS175 @ U13
- 1 - 74LS32 @ U14
- 1 - 74LS86 @ U15
- 1 - 74LS30 @ U16



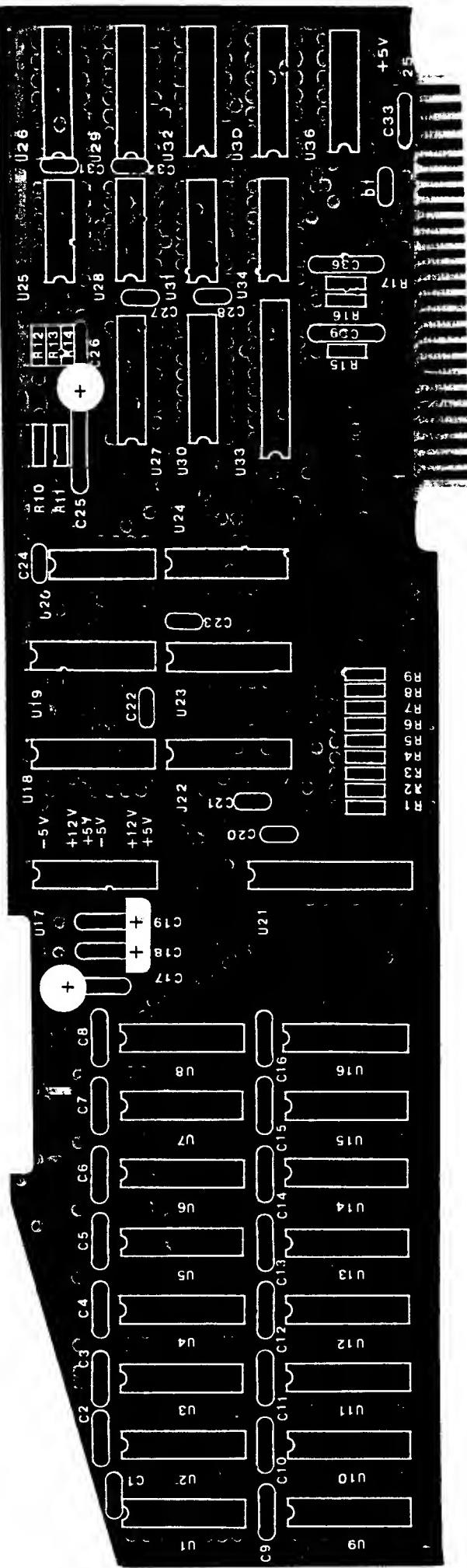
INSTALLATION

*With POWER OFF, install as follows:
Remove one 4116 RAM IC from location E3 of motherboard (extreme upper left corner). Connect the ribbon cable from location J (jumper) of the 16 K card to E3 socket of the motherboard. *MATCH pin 1 of J to pin 1 on the motherboard.



128 K RAM EXPANDER: Allows user to expand the computer's memory to a full 128 K of dynamic RAM. With power off, install in: a) slot #, if no other memory card is available; b) any available slot, if other memory card is in slot #.

Requires software (three disks) and firmware (one PAL).



*INDICATES A PRECAUTION

DIODE D *Position banded end (cathode) of diode towards the SQUARE solder pad

RESISTORS R $\frac{1}{4}$ watt, 5%

R @ R15, 16, 17

Ω @ R1 to 9, R11, 13, 14

2 - 5.6 kΩ @ R10, 12

SOCKETS *Match pin 1 of sockets with pin 1 on layout. Check that ALL pins have passed thru ALL holes

- 10 - 14-pin for ALL sockets and ICs
- 24 - 16-pin
- 2 - 20-pin

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INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 on the layout

2 - 74LS08 @ U25, 36

1 - 74LS244 @ U21

1 - 74LS32 @ U34

1 - 74LS37 @ U28

3 - 74LS74 @ U29, 31, 35

1 - 74LS107 @ U32

2 - 74LS158 @ U22, 23

2 - 74LS175 @ U27, 30

2 - 74LS258 @ U18, 19

1 - 74LS367 @ U24

2 - 74LS393 @ U20, 26

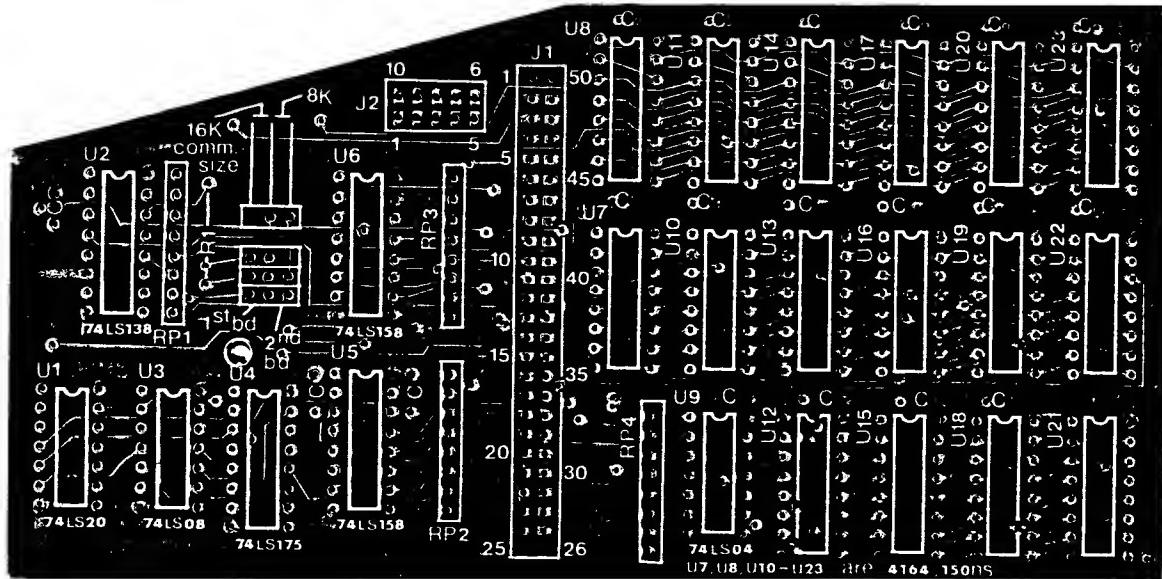
- empty slot @ U17

1 - PAL10L8 (MMI) Programmed Array Logic

16 - 4164 RAM, 200 ns @ U1 to 16

GUIDE 2-8

Z-80/64K 128 K RAM EXPANDER: This card adds 128 K bytes of memory and can only be used with the Z80/64 K card (GUIDE 4-4). With power off, mate female headers J1 & J2 of the EXPANDER card with the male headers P2 & P3 respectively, of the Z80/64 K card. Requires software.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 22 Ω R1
- 4 - 22 Ω (or 33 Ω) SIP*, isolated
@ RP1,2,3,4 White dot is pin 1
*Four discrete resistors may
be substituted for each SIP

SOCKETS *Match pin 1 of sockets with pin 1
on the layout. Check that ALL pins
have passed thru ALL holes

- 3 - 14-pin
- 20 - 16-pin pin 1 →

CAPACITORS C

- 19 - 0.1 Monolithic

HEADER STRIPS

- 1 - 1x2 male, straight @ 2
- 3 - 1x3 male, straight @ 1,3,4
- *J1 & J2 are mounted on the SOLDER
SIDE and soldered to the COMPONENT
SIDE
- 1 - 2x25 female @ J1*
- 1 - 2x5 female @ J2*

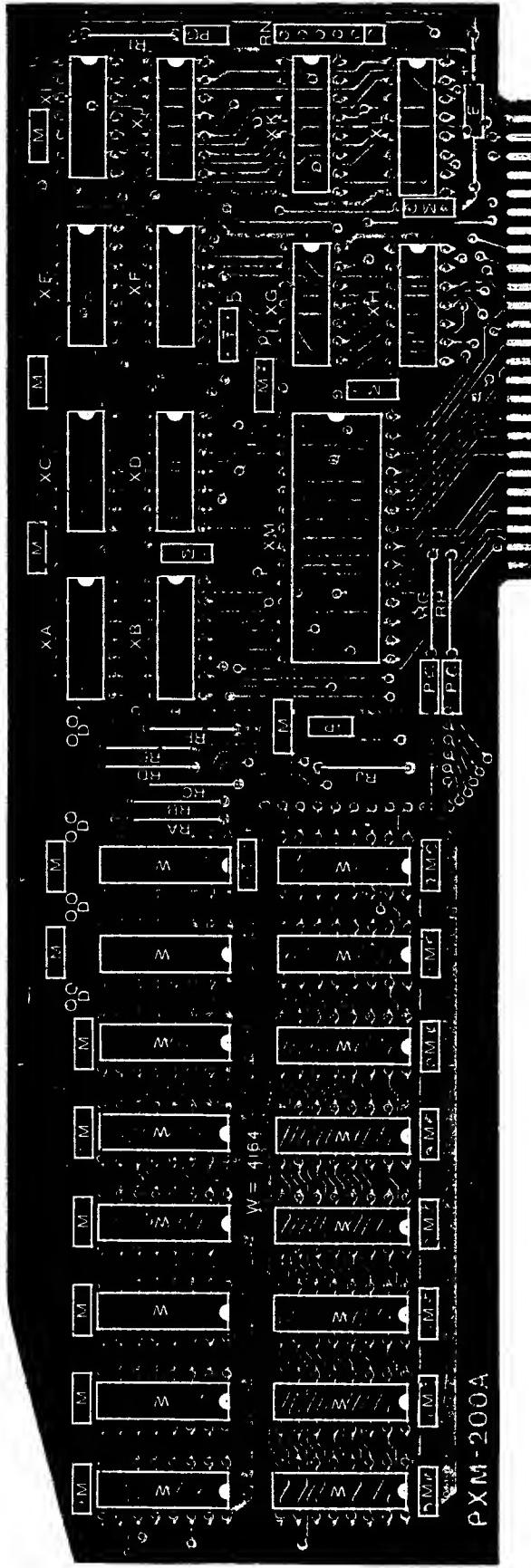
INTEGRATED CIRCUITS *Match pin 1 of ICs
with pin 1 on the layout

- 1 - 74LS04
- 1 - 74LS08
- 1 - 74LS20
- 1 - 74LS138
- 2 - 74LS158 or 74LS258
- 1 - 74LS175
- 16 - 4164 RAM 150 ns, 7-bit refresh



GUIDE 2-9

PRELUDE 128 EXTENDER: Increase the 48 K bytes of on-board memory by 128 K bytes. With power off, install in slot 0. Requires software (three diskettes).



*INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

6 - 100 Ω @ RA,B,G,H,I,J
4 - 470 Ω @ RC,D,E,F

1 - 2.2 kΩ 6-pin SIP* @ RN
*Match pin 1 of SIP

with pin 1 (square) on layout
with pin 1 on the layout

CAPACITORS C

4 - 22 pF @ P
24 - 0.1 μF Monolithic @ M
2 - 2.2 μF/25V Tantalum* @ T
1 - 10 μF/25V Axial* @ B

*Match + of capacitors
with + on the layout

INTEGRATED CIRCUITS *Match pin 1 of ICs

with pin 1 on the layout

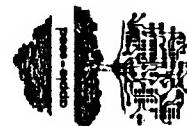
1 - 74LS00 @ XI
1 - 74LS02 @ XH
1 - 74LS08 @ XJ
2 - 74LS51 @ XA,B
1 - 74LS74 @ XF
1 - 74LS93 @ XE
1 - 74LS107 @ XD
2 - 74LS175 @ XK,L
1 - 74LS260 @ XC
1 - 74LS266 @ XG
16 - 4164 RAM @ W

DIODES D (LED)

4 - LEDs* @ D Match + of LEDs
with + on the layout as shown
• • +

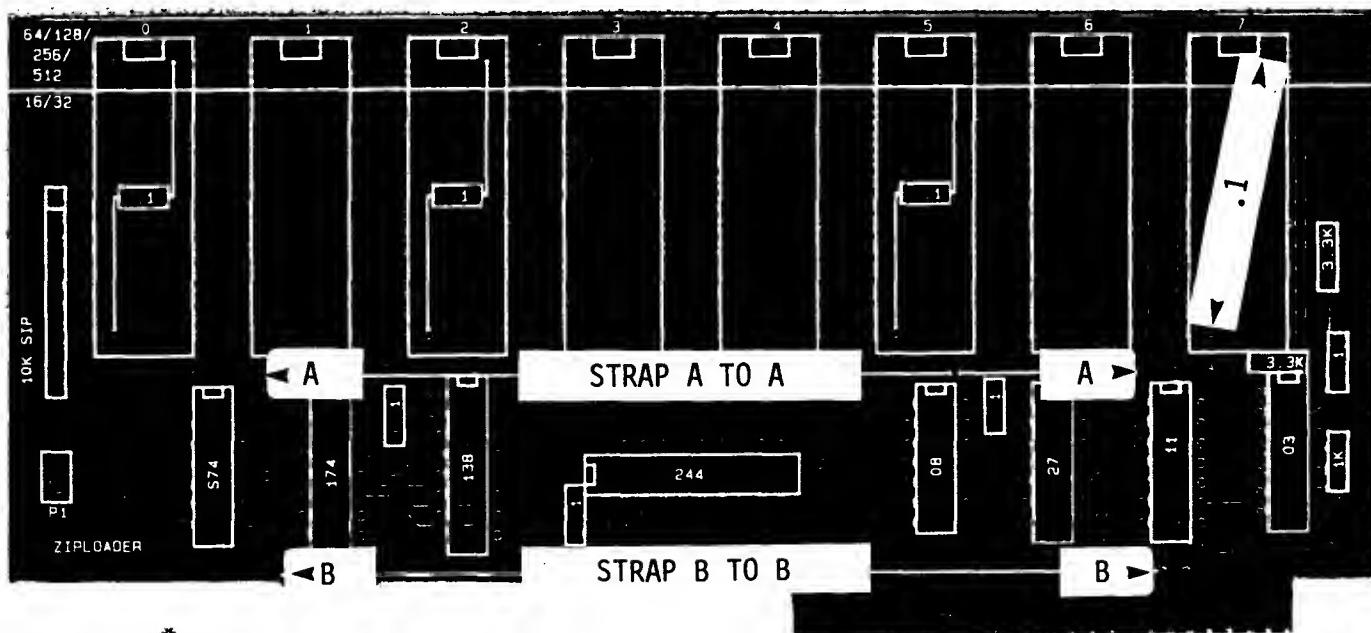


NuScope Associates



GUIDE 2-10

ZIP LOADER: Stores up to 512K RAM of programs in eight EPROMs for instant loading. Accepts standard 27 series (2708 to 27512) EPROMs. With power off, install in any slot except Ø. Requires software (one diskette).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS $\frac{1}{4}$ watt, 5%

- 1 - 1 KΩ
- 2 - 3.3 KΩ
- 1 - 10 KΩ 10-pin SIP bussed* Match pin 1 of SIP with pin 1 (square) on the layout

MODIFICATION: as shown on the layout
Use two jumper wires to strap
A to A
B to B

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 5 - 14-pin
- 2 - 16-pin
- 1 - 20-pin
- 8 - 28-pin

CAPACITORS C

- 4 - 0.1 μF Monolithic @ .1

*Install the following capacitors on the SOLDER SIDE.

- 4 - 0.1 μF axial labelled .1 in the middle of each EPROM socket Ø,2,5,7 as shown on the layout

SWITCH

- 1 - SP/ST (single pole single throw)
@ P1

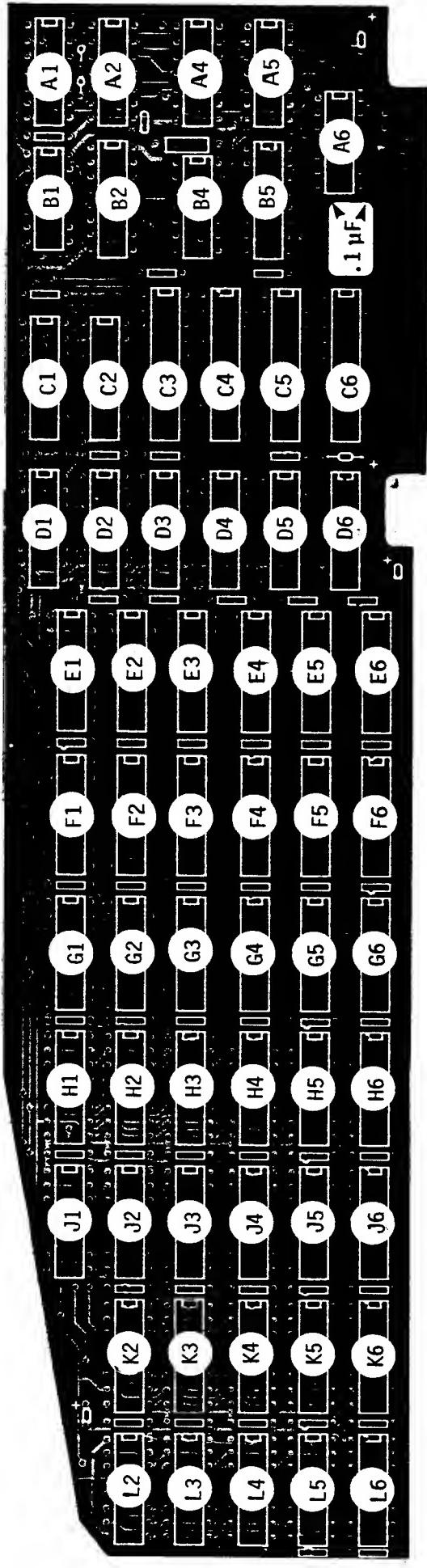
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS03
- 1 - 74LS08
- 1 - 74LS11
- 1 - 74LS27
- 1 - 74LS74
- 1 - 74LS138
- 1 - 74LS174
- 1 - 74LS244



GUIDE 2-11

FAST DISK II: RAM Disk Emulator. Stores data in RAM rather than on disks for fast recall. Each card holds 288 K bytes of memory - the equivalent of two disk drives. With power off, install in any slot. Recommended: Slot 5 for first Fast Disk; Slots 5 and 4 for first and second Fast Disk cards, respectively. Requires software drivers (DOS, CP/M, PASCAL).



*INDICATES A PRECAUTION

SEQUENCE *Match pin 1 of sockets with
SOCKETS pin 1 on the layout. Check that
 ALL pins have passed thru ALL
 holes

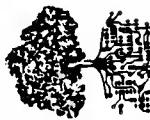
7 - 14-pin 2 - 33 . Ω 1/8 watt @ 5%
50 - 16-pin Install on end
4 - 20-pin 1 - 1 k Ω 1/4 watt @ 5%
 between A4 and B4
 with pin 1 on the layout

INTEGRATED CIRCUITS *Match pin 1 of IC
 C
CAPACITORS 2 - 74LS00 @ A1,B4
 2 - 74LS32 @ A4,A6
 1 - 74LS42 @ B5
 2 - 74LS74 @ A5,B1
 1 - 74LS132 @ A2
 1 - 74LS245 @ C6
 3 - 74LS374 @ C3,C4,C5
 1 - CD4040 @ B2

INTEGRATED CIRCUITS (continued)

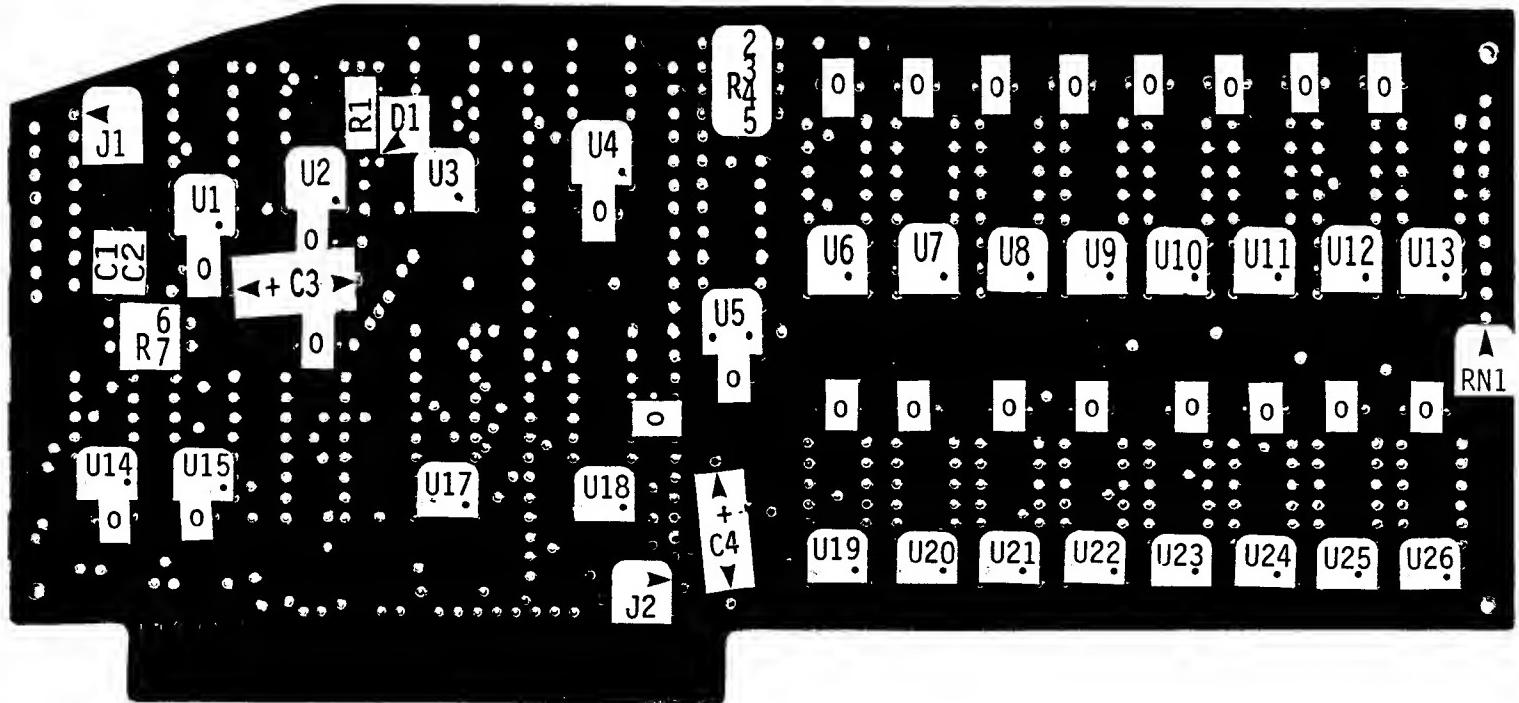
16 - 4116 DRAM 150 ns @ D5,6; E5,6;
F5,6; G5,6; H5,6; J5,6; K5,6;
L5,6
32 - 4164 DRAM 150 ns @ C1,2; D1,2,3,4;
E1,2,3,4; F1,2,3,4; G1,2,3,4;
H1,2,3,4; J1,2,3,4; K2,3,4;
L2,3,4

Memory ICs for second disk drive
include: D3,4,6; E3,4,6;
F3,4,6; G3,4,6; H3,4,6;
J3,4,6; K3,4,6; L3,4,6



GUIDE 2-12

MEGAWORKS I (IIe): Add 80-column text, double Hi Res graphics, and up to 512K memory. With power off, install in auxilliary slot. Requires software (one to three diskettes), modification (one cut).



SEQUENCE *INDICATES A PRECAUTION *MODIFICATION REQUIRED ON COMPONENT SIDE

MODIFICATION REQUIRED ON THE COMPONENT SIDE: Cut trace between pin 13 of U15 and the nearest plate-thru hole

DIODES * Position banded end (cathode) of diode towards the arrow
1 - 1N4148 @ D1 *Shortest distance

RESISTORS R $\frac{1}{4}$ watt, 5%
5 - 56 Ω @ R2,3,4,5,7
1 - 270 Ω @ R6
1 - 2.2 K Ω @ R1
1 - 1 K Ω 10-pin SIP*, bussed @ RN1. *Match pin 1 of SIP with pin 1 (arrow) on layout

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

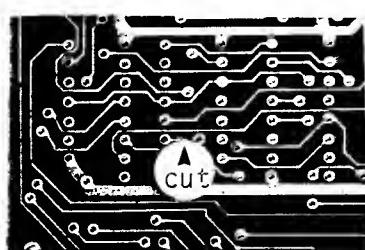
4 - 14-pin
19 - 16-pin
3 - 20-pin

CAPACITORS C
2 - 22 pF @ C1,2 pin 1
24 - 0.1 μ F Monolithic @ .0.
2 - 10 μ F/16V Axial* @ C3,4
* Match + of Axial with + on the layout

HEADERS female, install on component side
1 - 1x8 @ J1
1 - 1x24 @ J2 for 512 Add-on card

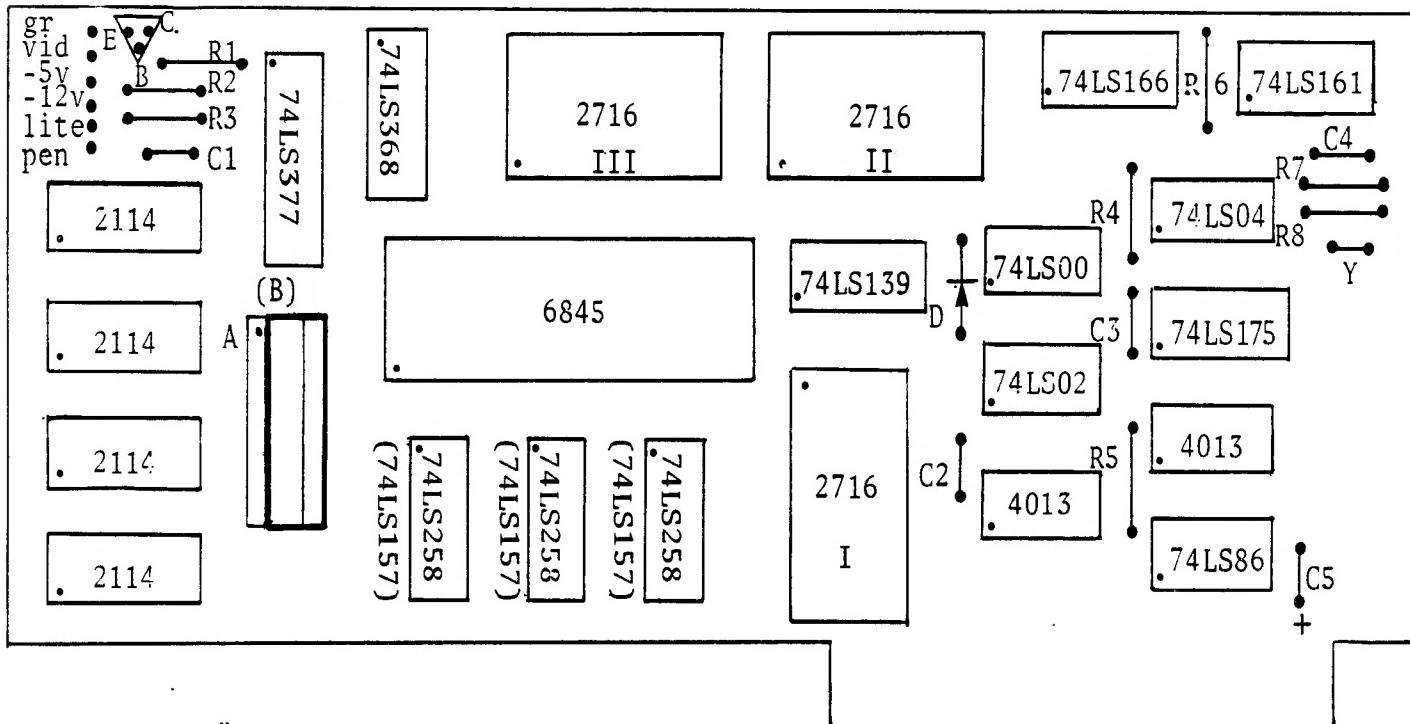
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout
1 - 74LS00 @ U15
1 - 74LS08 @ U2
1 - 74LS32 @ U4
1 - 74LS51 @ U14
1 - 74LS139 @ U1
1 - 74LS173 @ U3
1 - 74LS175 @ U16
1 - 74LS245 @ U17
1 - 74LS373 @ U5
1 - 74LS374 @ U18
16 - 41256 DRAM 150 ns @ U6 to 13 @ U19 to 26

MODIFICATION: Cut trace from pin 13 of U15 as shown below



GUIDE 3-1

80-COLUMN CARD: Allows the user to display 80 characters on the video screen.
With power off, install in slot 3. Requires firmware (2 or 3 EPROMS).



SEQUENCE *INDICATES A PRECAUTION

DIODE D *Position banded end (cathode) of diode as shown



RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 180 Ω @ R1
- 1 - 47 Ω @ R2
- 1 - 20 Ω @ R3
- 1 - 2.2 K Ω @ R4
- 1 - 1.5 K Ω @ R5
- 1 - 1 K Ω @ R6
- 1 - 220 Ω @ R7,8



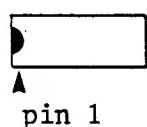
CAPACITORS C

- 2 - 0.1 μ F @ C1,2
- 1 - 100 pF @ C3
- 1 - 220 pF @ C4
- 1 - 10 μ F/16v Tantalum* @ C5
*Match + of capacitor with + on layout



SOCKETS *Match pin 1 of socket with pin 1 on layout. Check that ALL pins have passed thru ALL holes

- 6 - 14-pin
- 8 - 16-pin
- 4 - 18-pin
- 2 - 20-pin
- 3 - 24-pin
- 1 - 40-pin



TRANSISTOR Q *Position EBC leads as shown on the layout

- 1 - 2N3904

CRYSTAL Y

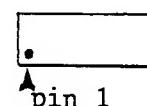
- 1 - 17.430 @ Y *Fold crystal against

the card before soldering

- HEADER 1 - 1x6 male header strip, straight

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on layout

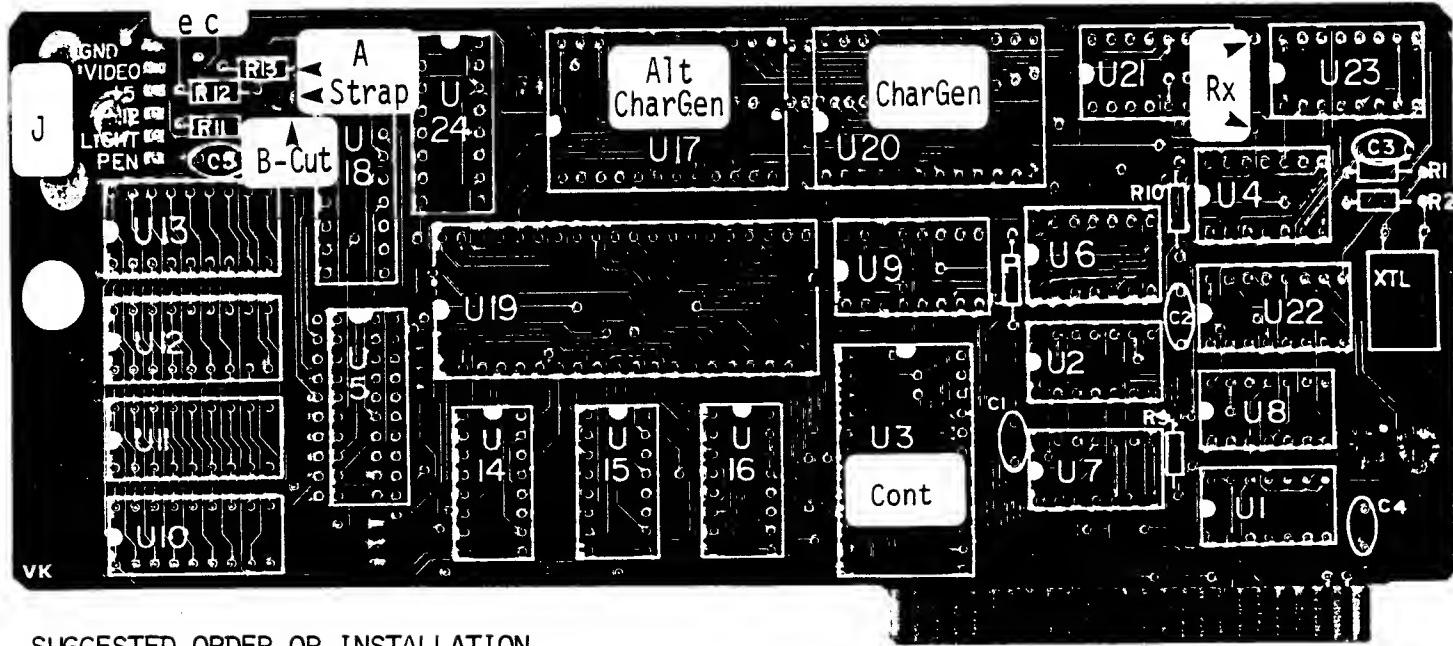
- 1 - 74LS00
- 1 - 74LS02
- 1 - 74LS04
- 1 - 74LS86
- 1 - 74LS139
- 1 - 74LS161
- 1 - 74LS166
- 1 - 74LS175
- 3 - 74LS258 OR (74LS157)
- 1 - 74LS368
- 1 - 74LS373 @ A* OR (74LS245 @ B*)
- 1 - 74LS377
- 2 - CD4013
- 3 - 2716 EPROMs
- 1 - 6845 MPU
- 4 - 2114 Static RAM



GUIDE 3-2

80-COLUMN CARD: Allows user to select 18 or 24 lines of text each of 80 characters; (VK) can display upper or lower case. With power off, install in slot 3.

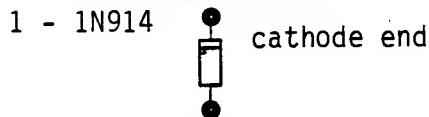
Q Requires firmware (two or three EPROMS).



SUGGESTED ORDER OF INSTALLATION

*INDICATES A PRECAUTION

DIODES D * Position banded end (cathode) of diode as shown



RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 10 Ω @ R13
- 1 - 160 Ω @ R12
- 1 - 200 Ω @ R11
- 2 - 220 Ω @ R1,2
- 1 - 1.5 K Ω @ R9
- 1 - 2 K Ω @ R10
- 1 - 1 K Ω @ Rx *As shown on the layout

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 6 - 14-pin
 - 8 - 16-pin
 - 4 - 18-pin
 - 2 - 20-pin
 - 3 - 24-pin
 - 1 - 40-pin
-

CAPACITORS C

- 1 - 100 pF @ C2
- 1 - 1,000 pF @ C4
- 3 - 0.1 μ F @ C1,4,5

CONNECTOR

— 1 - 6 pin header right angle AND/OR

TRANSISTOR Q *Position EBC leads as shown on the layout

- 1 - 2N3904 @ Q

CRYSTAL Y

- 1 - 17.430 MHz @ XTL *Fold body of crystal flat against the board before soldering

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

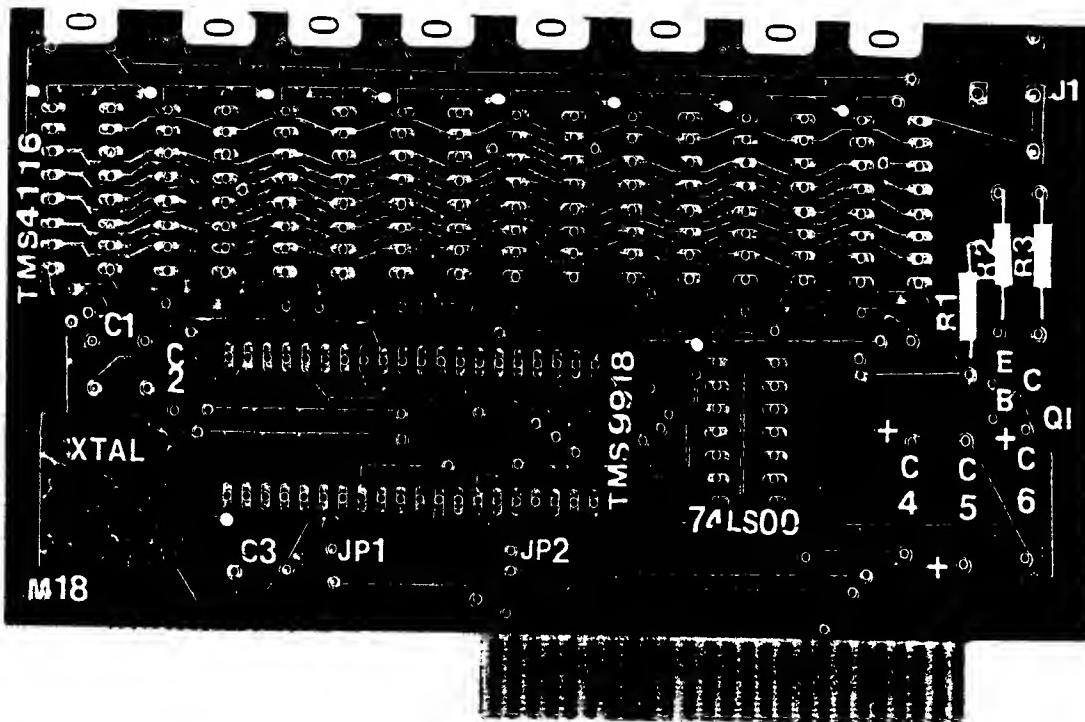
- 1 - 74LS00 @ U6
- 1 - 74LS02 @ U2
- 1 - 74LS04 @ U4
- 1 - 74LS86 @ U1
- 1 - 74LS139 @ U9
- 1 - 74LS161 @ U23
- 1 - 74LS166 @ U21
- 3 - 74LS157 @ U14,15,16
- 1 - 74LS175 @ U22
- 1 - 74LS245 @ U5
- 1 - 74LS368 @ U24
- 1 - 74LS374 @ U18
- 2 - CD4013 @ U7,8
- 1 - 6845 MPU @ U19
- 2 - 2716 EPROMS @ U17,20
- 1 - 2708 EPROM @ U3
- 4 - 2114 Static RAM @ U10,11,12,13



MODIFICATIONS *As shown on the layout @ A & B
A-Strap the two large pads
B-Cut the trace between the two large pads

GUIDE 3-3

SPRITE GRAPHICS CARD: Create graphics that can be made to move smoothly & quickly across the screen. With power off, install in slot number 1-5. Reference: High-Resolution Sprite-Oriented Colour Graphics by Steven A Ciarcia; pg. 57; Aug, 1982; BYTE Publications Inc.



SUGGESTED ORDER OF INSTALLATION

*INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 33 Ω @ R2
- 1 - 330 Ω @ R3
- 1 - 10 K Ω @ R1

SOCKETS *Match pin 1 of sockets with the white dot (pin 1) on the layout. Check that ALL pins have passed thru ALL holes

- 1 - 14-pin
- 8 - 16-pin
- 1 - 40-pin

CAPACITORS C

- 2 - 33 pF disc @ C1,2
- 1 - 5-50 pF trimcap @ C3
- 8 - 0.1 μ F Monolithic @ positions marked \odot on the layout
- 3 - 10 μ F/16v axial* @ C4,5,6
*Match + of capacitors with + on the layout

TRANSISTORS Q *Match the three EBC transistor leads with EBC on the layout

- 1 - 2N2222 @ Q1

CRYSTAL Y

- 1 - 10.7386 MHz @ XTAL *Position body of crystal against the card. Insulate the card from crystal with tape

CONNECTOR

- 1 - RCA video jack, PCB mount @ J1

INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 (white dot) on layout

- 1 - 74LS00
- 8 - TMS4116 RAM
- 1 - TMS9918A colour video display processor (T.I.)

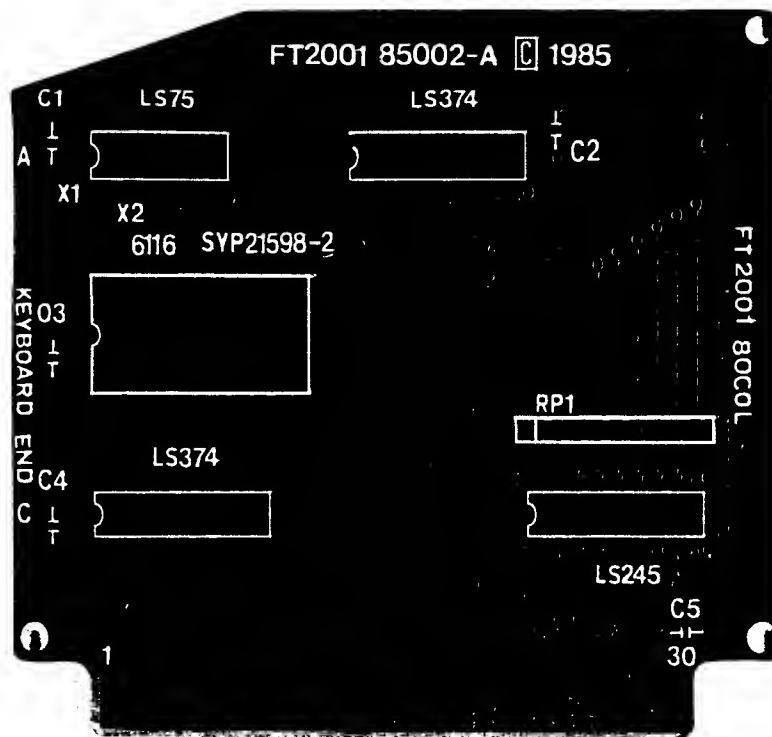
pin 1 •  white dot for ALL sockets & ICs

NuScope Associates



GUIDE 3-5

80 COLUMN (IIe): Add 80 column text to the motherboard. With power off, install in the "auxilliary" slot.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 3.3 KΩ 10-pin SIP* bussed @ RP1
 - *Match pin 1 of SIP with pin 1 (square) on the layout

SOCKETS *Match pin 1 of sockets with pin 1 (square pad) on the layout.
Check that ALL pins have passed thru ALL holes before soldering

- 1 - 16-pin
- 3 - 20-pin
- 1 - 24-pin

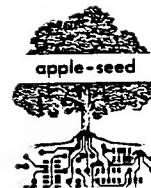
pin 1

CAPACITORS C

- 5 - 0.1μ F Monolithic @ C1,2,3,4,5

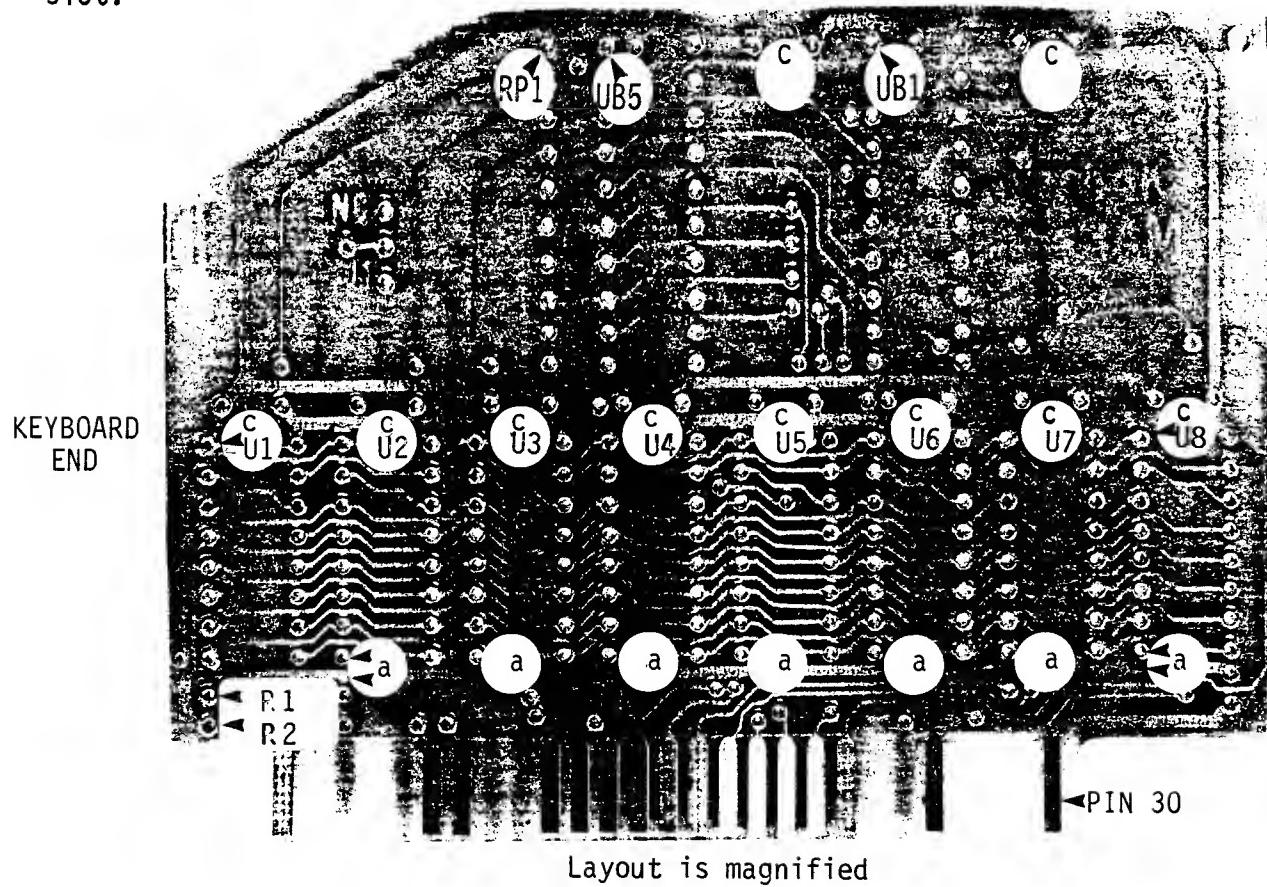
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS75
- 1 - 74LS245
- 2 - 74LS374
- 1 - 6116



GUIDE 3-6

80 COLUMN/64K EXPANDER (IIE): Provides 80 column text as well as 64 K bytes of RAM memory to the motherboard. With power off, install in the special "auxilliary" slot.



SEQUENCE *INDICATES A PRECAUTION *SOME CARDS MAY REQUIRE MODIFICATION AT "a"

*MODIFICATION: At "a" strap pin 8 of each HEADER
of U2,3,4,5,6,7,8 to bus bar connecting to _____ 1 - 1x3 male, straight @ J1
pin 30 (+5V) of card edge connector as shown.

RESISTORS R $\frac{1}{4}$ watt, 5%

2 - 47 Ω @ R1,2

1 - 3.3 K Ω 10-pin SIP* bussed @ RP1
*Pin 1 is indicated by the arrow

SOCKETS *Match pin 1 of sockets with pin 1 (arrow) on the layout. Check that ALL pins have passed thru ALL holes.

8 - 16-pin

2 - 20-pin

CAPACITORS C

10 - 0.1 μ F Monolithic @ "c"

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 (arrow) on the layout

1 - 74LS245 @ UB5

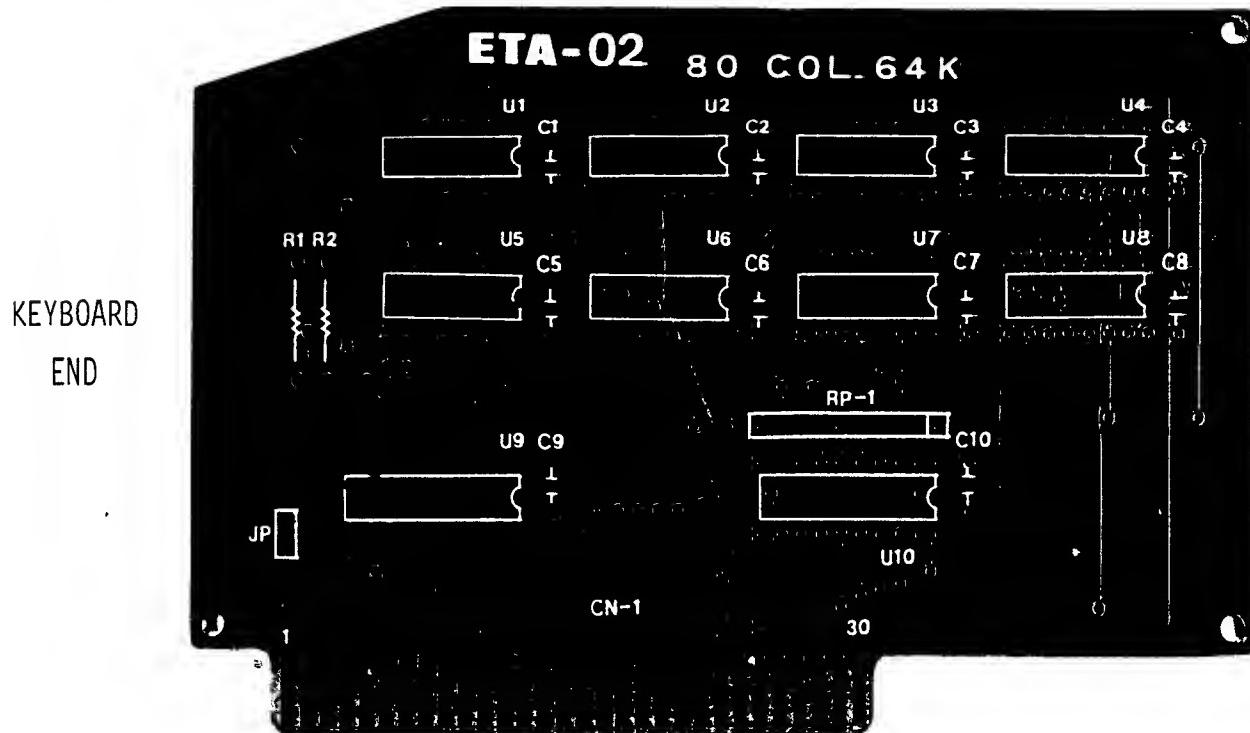
1 - 74LS374 @ UB1

8 - 4164 RAM @ U1, 2, 3, 4, 5, 6, 7, 8



GUIDE 3-7

COLLEGE 80 COLUMN/64 K CARD (IIe): Add an additional 64 K bytes of RAM memory to the motherboard as well as 80 column text. With power off, install in the "auxilliary" slot.



SEQUENCE *INDICATES A PRECAUTION

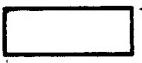
RESISTORS R $\frac{1}{4}$ watt, 5%

— 2 - 47 Ω @ R1,2

— 1 - 3.3 K Ω 10-pin SIP* bussed @ RP-1

*Match pin 1 of SIP with pin 1
(square) on the layout

SOCKETS *Match pin 1 of sockets with pin
1 on the layout. Check that ALL pins
have passed thru ALL holes

— 8 - 16-pin 

— 2 - 20-pin 

CAPACITORS C

— 10 - 0.1 μ F Monolithic @ C1 to C10

HEADER

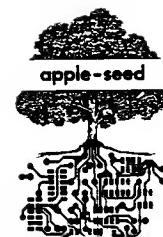
— 1 - 1x2 header, straight, male @ JP

INTEGRATED CIRCUITS *Match pin 1 of ICs
with pin 1 on the layout

— 1 - 74LS245 @ U10

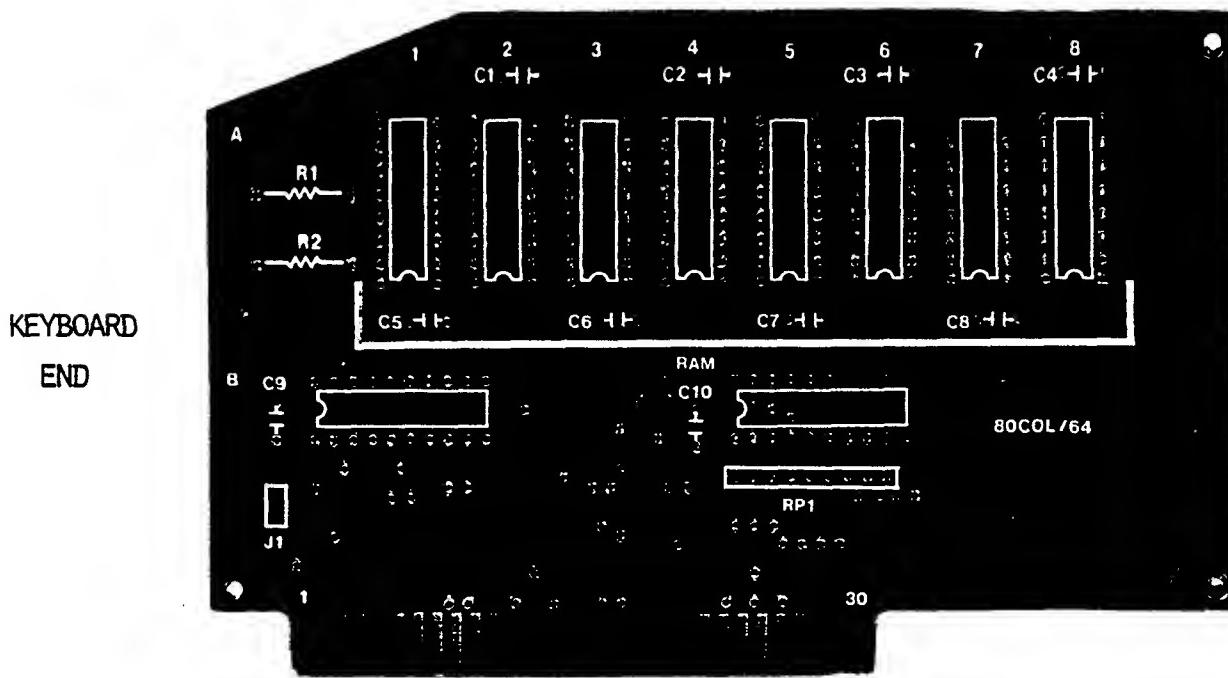
— 1 - 74LS374 @ U9

— 8 - 4164 RAM @ U1,2,3,4,5,6,7,8



GUIDE 3-8

JK 80 COLUMN/64K CARD: Provides 80-column text as well as 64 K bytes of RAM memory to the motherboard. With power off, install in the special "auxilliary" slot.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

— 2 - 47 Ω @ R1,2

— 1 - 3.3 K Ω 10-pin SIP* bussed @ RP1

*Match pin 1 of SIP with pin 1
(square) on the layout

SOCKETS *Match pin 1 of sockets with pin 1
on the layout. Check that ALL pins
have passed thru ALL holes

— 8 - 16-pin

— 2 - 20-pin

CAPACITORS C

— 10 - 0.1 μ F Monolithic @ C1 to 10

HEADER

— 1 - 1x2 straight, male @ J1

INTEGRATED CIRCUITS *Match pin 1 of ICs
with pin 1 on the layout

— 1 - 74LS245 @ B-5

— 1 - 74LS374 @ B-1

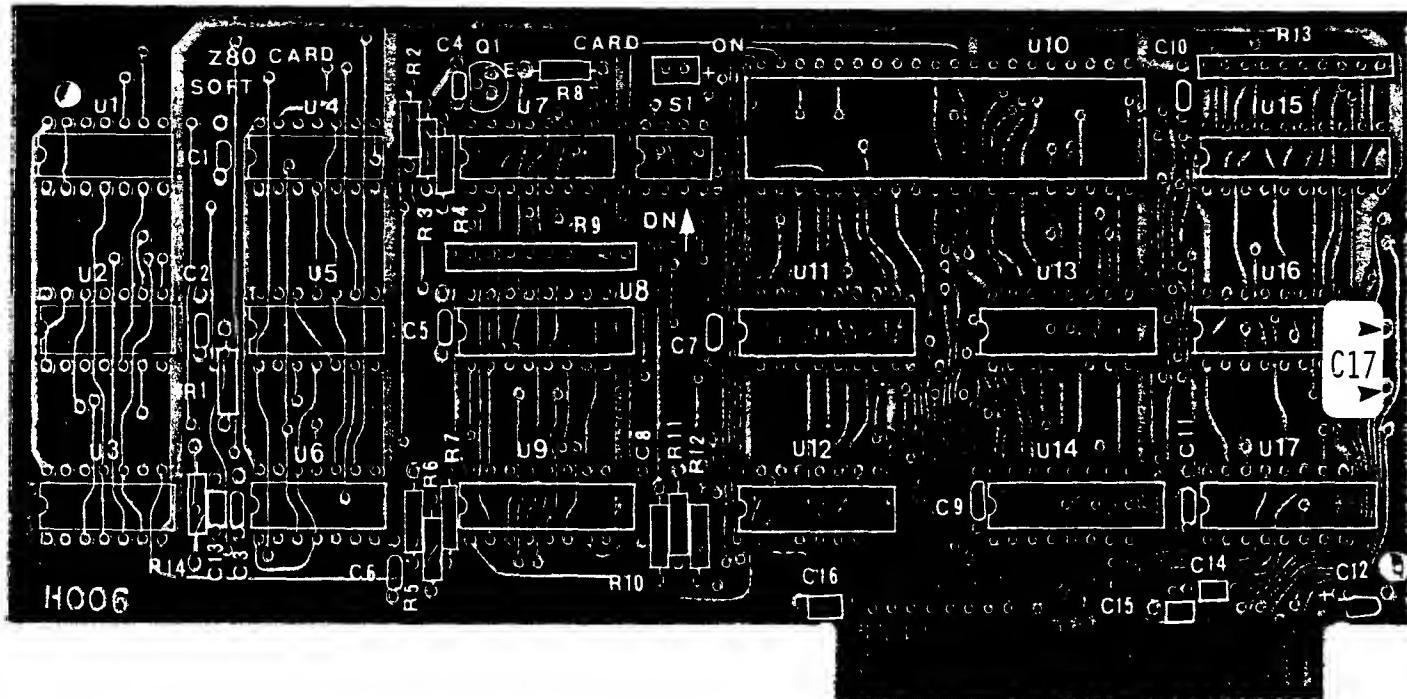
— 8 - 4164 RAM @ A-1 to A-8

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GUIDE 4-1

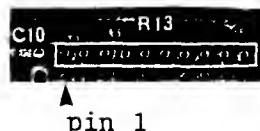
Z 80 CARD: Allows one to run software written for the Z 80 based microcomputer (CP/M operating system). With power off, install in slot number 4.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 2.2 K Ω @ R1
- 1 - 27 Ω @ R2
- 1 - 220 Ω @ R3
- 2 - 1 K Ω @ R4,14
- 4 - 100 Ω @ R5,6,11 12
- 2 - 4.7 K Ω @ R7,10
- 1 - 680 Ω @ R8
- 2 - 10 K Ω SIP
@ R9,13

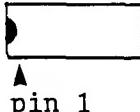


CAPACITORS C

- 11 - 0.1 μ F @ C1,2,3,5,7,9,10
11,14,15,16
- 1 - 50 pF @ C4
- 3 - 220 pF @ C6,8,13
- 1 - 4.7 μ F/25v Tantalum @ C12
*match + of capacitor with
+ on layout

SOCKETS *Match pin 1 of socket with pin 1 on layout. Check that ALL pins have passed thru ALL holes.

- 8 - 14-pin
- 7 - 16-pin
- 1 - 20-pin
- 1 - 40-pin



TRANSISTOR Q *Install 3 leads as shown.

- 1 - 2N3906

— F *Check with supplier

LIGHT EMITTING DIODE

- 1 - LED *position longer lead (+)
as shown on layout



SWITCH S1

- 1 - 4-position DIP
Functions:
1 - address offset when off
2 - Z80 DMA when on
3 - non-maskint when on
4 - Z80 interrupts when on

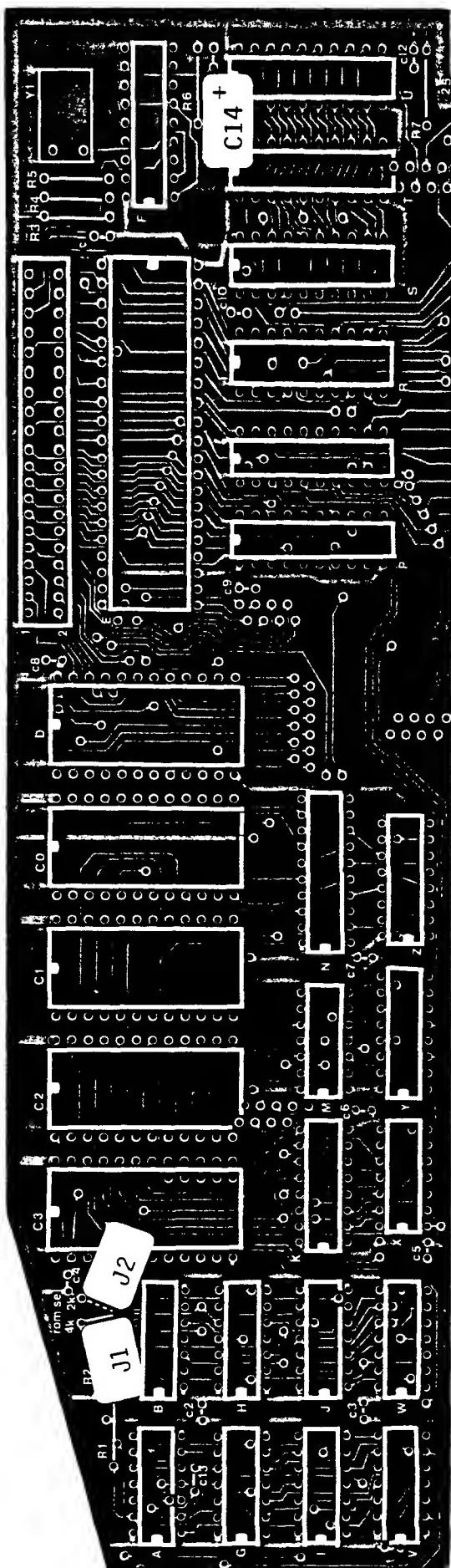
INTEGRATED CIRCUITS * match pin 1 of IC with pin 1 on layout

- 1 - 74LS00 @ U1
- 1 - 74LS05 @ U2
- 1 - 74LS32 @ U3
- 1 - 74S20 @ U12
- 2 - 74LS74 @ U5,6
- 1 - 74LS86 @ U7
- 1 - 74LS107 @ U4
- 1 - 74LS138 @ U11
- 1 - 74LS283 @ U8
- 5 - 74LS367 @ U9,13,14,16,17
- 1 - 74LS373 @ U15
- 1 - Z80A @ U10



GUIDE 4-2

3 CARD: Accesses the 64K bytes of the computer's memory. The 8088 (16-bit word size) and the 6502 (8-bit) can both run simultaneously to provide faster execution speed of existing programs. Allows development of programs that will run on the 8088 microprocessor. With power off, install in any slot except \emptyset . Requires 64K bytes of RAM, firmware (one EPROM), and software (one disk).



SUGGESTED SEQUENCE * INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 4 - 2 K Ω @ R1, 2, 3, 7
- 2 - 510 Ω @ R4, 5
- 1 - 5.6 K Ω @ R6

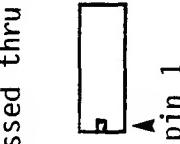
SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 10 - 14-pin
- 3 - 16-pin
- 1 - 18-pin
- 7 - 20-pin
- 5 - 24-pin
- 1 - 40-pin

CAPACITORS C @ POSITIONS LABELLED •—• ON THE LAYOUT

- 1 - 0.001 μ F @ C13
- 12 - 0.1 μ F @ C1, 2, 3, 4, 5, 6, 7, 8, C9, 10, 11, 12
- 1 - 6.8 μ F/16V Tantalum* @ C14 *Match + of capacitor with + on the layout

CONNECTOR



JUMPER

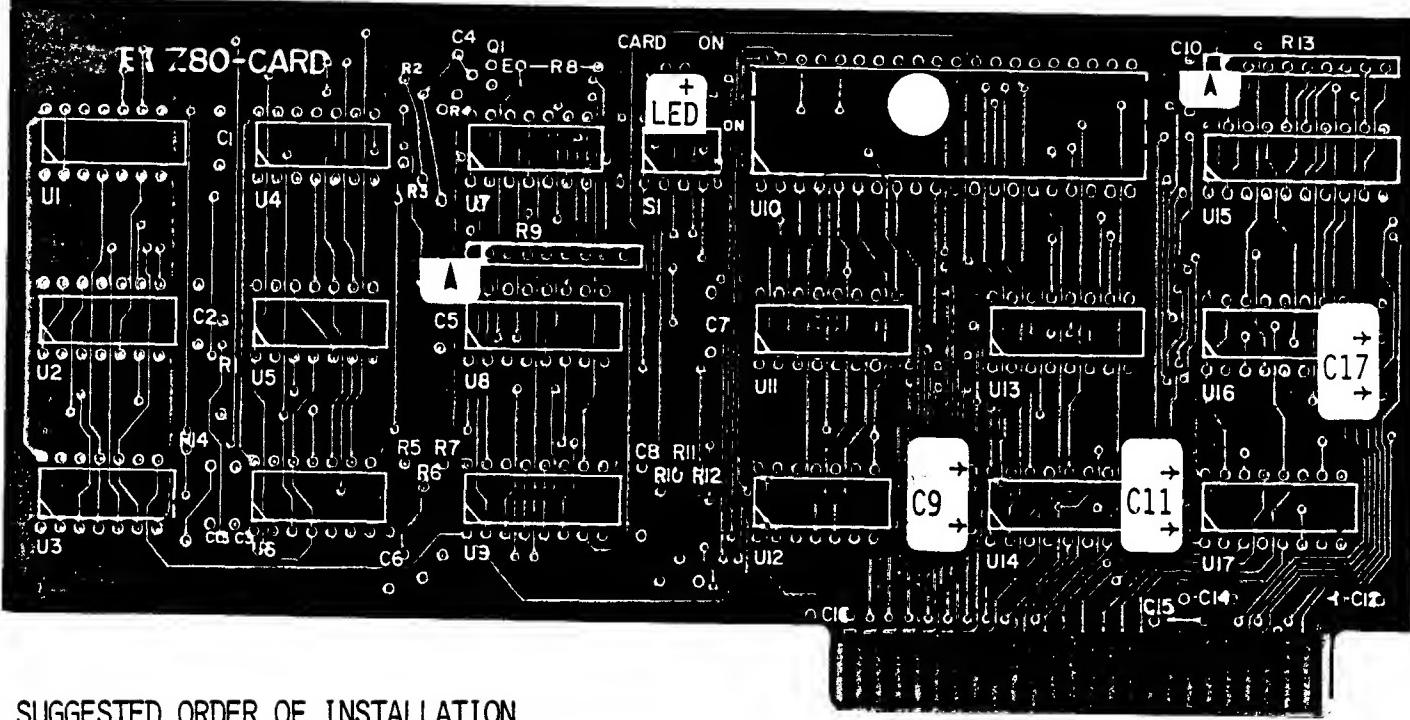
- 1 - Refer to layout: J1 for 2732A 4K EPROM } @ rom sel
OR J2 for 2716 2K EPROM }

CRYSTAL Y

- 1 - 15.000 MHz @ Y1 *Fold crystal flat
against the card before soldering

GUIDE 4-3

EK Z80-CARD: Allows one to use the CP/M operating system with the Z80 microprocessor installed. With power off, install in slot number 4.



SUGGESTED ORDER OF INSTALLATION

*INDICATES A PRECAUTION

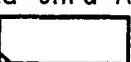
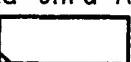
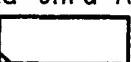
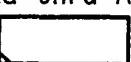
RESISTORS $\frac{1}{4}$ watt, 5%

- 1 - 2.2 K Ω @ R1
- 1 - 22 Ω @ R2
- 1 - 220 Ω @ R3
- 1 - 1.2 K Ω @ R4
- 5 - 100 Ω @ R5,6,11,12,14
- 2 - 4.7 K Ω @ R7,10
- 1 - 680 Ω @ R8
- 2 - 10 K Ω SIP, 10-pin @ R9,13 *Position pin 1 of SIPs as shown on the layout

CAPACITORS C

- 11 - 0.1 μ F Monolithic @ C1,2,3,5,7,9,10, C11,14,15,16
- 2 - 47 pF @ C4,17
- 3 - 200 pF @ C6,8,13
- 1 - 2.2 μ F/35V Tantalum* @ C12 *Match + of capacitor with + on the layout

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes.

- 8 - 14-pin 
- 7 - 16-pin 
- 1 - 20-pin 
- 1 - 40-pin  pin 1 lower left for ALL sockets

TRANSISTOR Q *Install EBC leads as shown

- 1 - 2N3906



LIGHT EMITTING DIODE LED

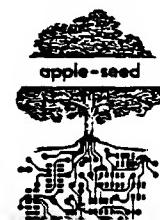
- 1 - LED @ CARD ON *Position longer lead (+) as shown on the layout

SWITCH

- 1 - DIP switch, 4-position @ S1 Functions: 1-address offset when off
2-Z80 DMA when on
3-non-mask int when on
4-Z80 interrupts when on

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS00 @ U1
- 1 - 74LS05 @ U2
- 1 - 74LS32 @ U3
- 1 - 74S20 @ U12 pin 1
- 2 - 74LS74 @ U5,6
- 1 - 74LS86 @ U7
- 1 - 74LS107 @ U4
- 1 - 74LS138 @ U11
- 1 - 74LS283 @ U8
- 5 - 74LS367 @ U9,13,14,16,17
- 1 - 74LS373 @ U15
- 1 - Z80A @ U10

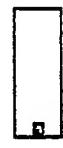


8088 CARD (continued)

INTEGRATED CIRCUITS

- 1 - 74LS14 @ X *Match pin 1 of ICs with pin 1 on the layout
- 1 - 74LS00 @ A
- 1 - 74LS04 @ G
- 1 - 74LS10 @ I
- 1 - 74LS27 @ V
- 1 - 74LS32 @ J
- 3 - 74LS74A @ B,H,M
- 1 - 74LS125 @ W
- 1 - 74LS139 @ K
- 2 - 74LS375 @ Y,Z
- 4 - 74SC244 @ N,Q,R,S
- 3 - 74SC373 @ P,T,U
- 1 - 8088 @ E MPU
- 1 - 8284 @ F Clock Generator and Driver
- 1 - EEPROM 350 ns @ D *Refer to the layout
- Strap J1 when using 2732A EPROM
- Strap J2 when using 2716 EPROM

pin 1



pin 1

*Match pin 1 of ICs with pin 1 on the layout

4 - TMM2016 (Toshiba) RAM, 2K bytes, 150 ns

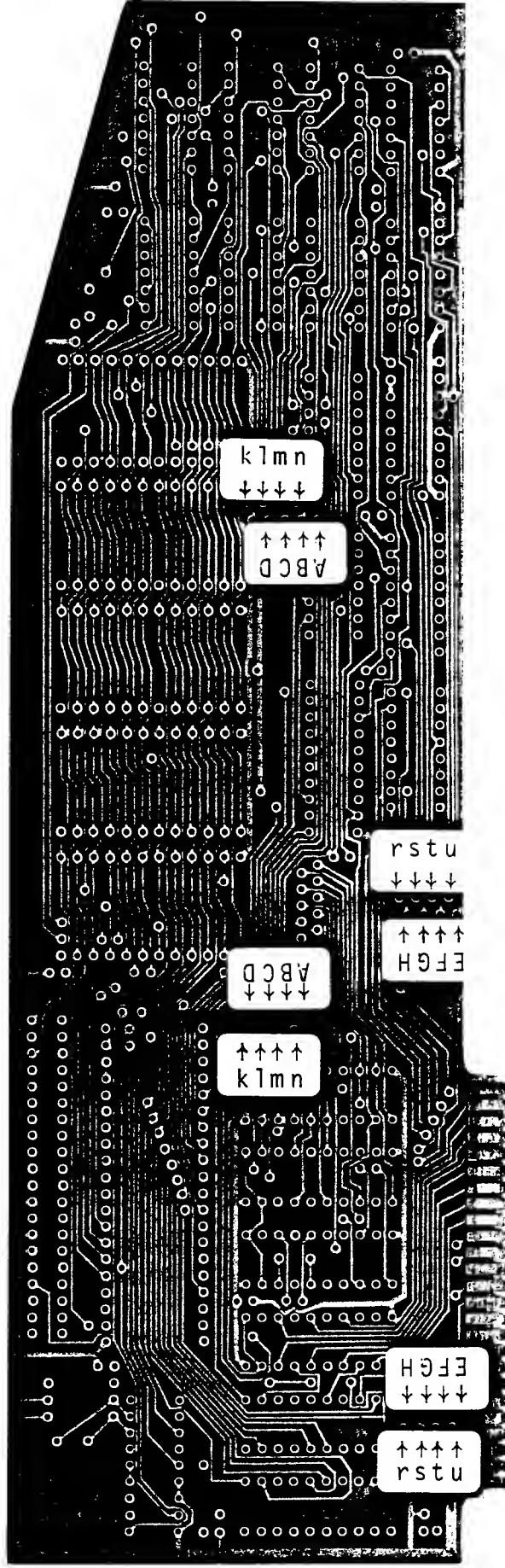
REQUIRED:
EXPANSION:

1 RAM @ C0	for 2K
2 RAM @ C0,1	for 4K
3 RAM @ C0,1,2	for 6K
4 RAM @ C0,1,2,3	for 8K

MODIFICATIONS TO THE SOLDER SIDE as shown on the layout
Connect jumper wires ON THE SOLDER SIDE as illustrated

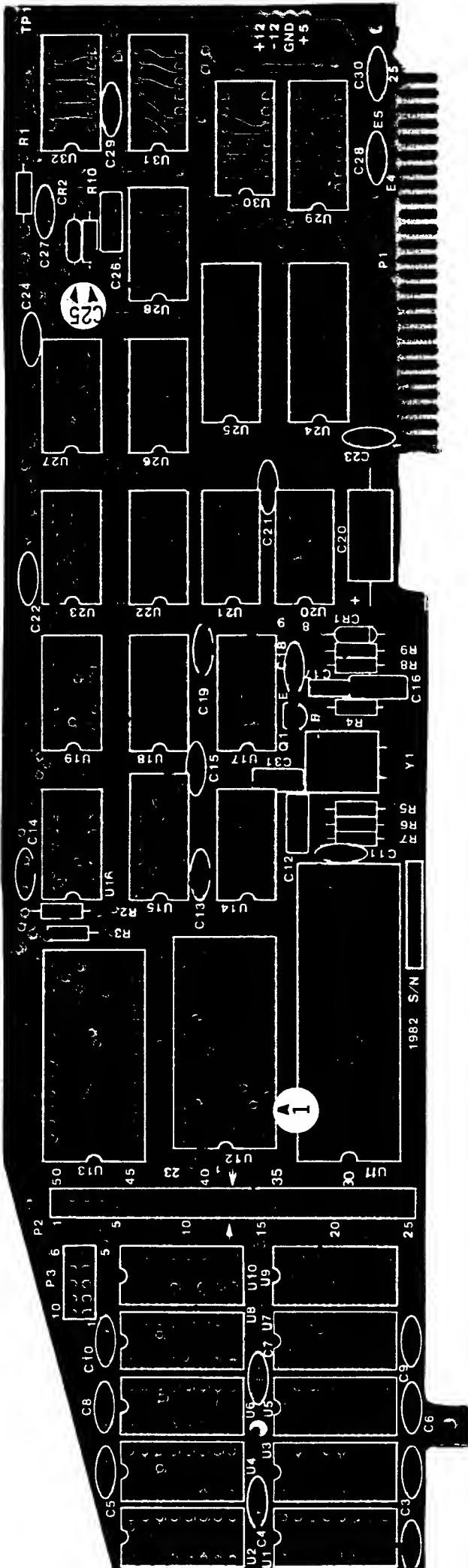
A to A k to k
 1-1
 Strap pin 13 to pin 14
 on IC number M on the
 SOLDER SIDE
 and
 B-B m-m
 C-C n-n
 D-D r-r
 E-E s-s
 F-F t-t
 G-G u-u

MODIFICATIONS TO THE SOLDER SIDE



GUIDE 4-4

Z80/64K CARD: Allows one to run software written for the Z-80 based microcomputer (CP/M operating system); expands on-board memory by 64 K. With power off, install in slot number 4. Requires firmware (one EPROM) and software (three disks).



*SEQUENCE *INDICATES A PRECAUTION

DIODES D *Match banded end (cathode) of CAPACITORS C *Delete C31
diode with the bar on the layout — 2 - 47 pF @ C25,26
1 - 1N4148 @ CR1 *Delete CR2 — 2 - 33 pF @ C16,17

RESISTORS R $\frac{1}{4}$ watt, 5% *Delete R1,10 — 1 - 0.01 μ F @ C12
1 - 27 Ω @ R7 — 24 - 0.1 μ F Monolithic @ C1,2,3,4,
2 - 1 k Ω @ R5,6 — C5,6,7,8,9,10,11,13,14,15, —
2 - 4.7 k Ω @ R2,3 — C18,19,21,22,23,24,27,28, —
2 - 10 k Ω @ R8,9 — C29,30
1 - 82 k Ω @ R4 — 1 - 100 μ F/16V Axial* @ C20

SOCKETS *Match pin 1 of sockets with pin 1
on the layout. Check that ALL pins
have passed thru ALL holes
15 - 14-pin
12 - 16-pin
2 - 20-pin
2 - 24-pin
1 - 40-nin

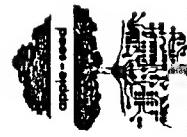
CRYSTAL *Fold crystal flat against
the card before soldering
1 - 12.000 MHz @ Y1

**NuScope
Associates**

TRANSISTORS Q *Match the EBC transistor
terminals with EBC on the layout
1 - 2N2907 @ Q1

CONNECTORS
1 - 25x2 male header, straight
@ P2
1 - 5x2 male header, straight
@ P3

— 1 - jumper plug: connect pin 13
to pin 38 of P2



10/64 K CARD (continued)

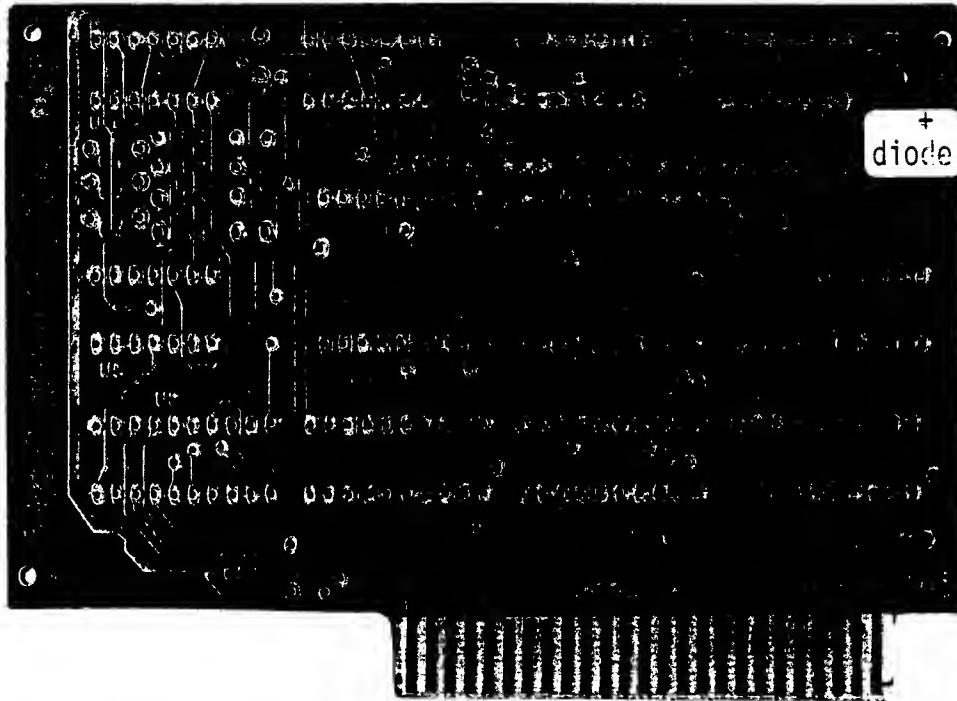
INTEGRATED CIRCUITS *Match pin 1 of
ICs with pin 1 on the layout

1 -	74LS00	@ U18	
- 2 -	74LS04	@ U14,19	
- 1 -	74LS08	@ U32	
- 1 -	74ALS11	@ U23	
- 2 -	74LS32	@ U16,28	
- 4 -	74LS74	@ U17,22,27,30	
- 1 -	74LS125	@ U31	
- 1 -	74LS132	@ U21	
- 2 -	74LS138	@ U15,29	
- 2 -	74LS158	@ U9,10	
- 2 -	74LS374	@ U24,25	
- 1 -	74LS393	@ U26	
- 1 -	74121	@ U20	
- 8 -	4164 RAM,	150 ns	
			@ U1,2,3,4,5,6,7,8
- 1 -	Z80B CPU,	6 MHz	@ U11
- 1 -	Z80B CTC,	6 MHz	@ U13 (optional)
- 1 -	2716 EPROM*	@ U12	

*Note position of
pin 1 on the layout

GUIDE 4-5

Z 80+ CARD: Allows user to run software written for the Z 80 based MPU (CP/M operating system). With power off, install in slot number 4.



SEQUENCE * INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- ____ 1 - 27 Ω @ R5
- ____ 3 - 82 Ω @ R3,4,6
- ____ 1 - 220 Ω @ R2
- ____ 1 - 12 K Ω @ R1
- ____ 2 - 1 K Ω 10-pin SIP* @ RP1,2
*Match pin 1 of SIPs
with pin 1 on the layout

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- ____ 6 - 14-pin
- ____ 3 - 20-pin
- ____ 1 - 40-pin

pin 1

CAPACITORS C

- ____ 1 - 37 pF @ C1
- ____ 1 - 100 pF @ C3
- ____ 2 - 200 pF @ C2,7
- ____ 3 - 0.1 μ F Monolithic @ C4,5,8
- ____ 1 - 10 μ F/16V Tantalum* @ C6
*Match + of Tantalum
with + on the layout

TRANSISTOR Q *Position EBC transistor leads as shown

- ____ 1 - 2N3904 @ Q1

E

C B

DIODE D

- ____ 1 - LED *Position longer lead (anode) of diode as shown @ D1

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

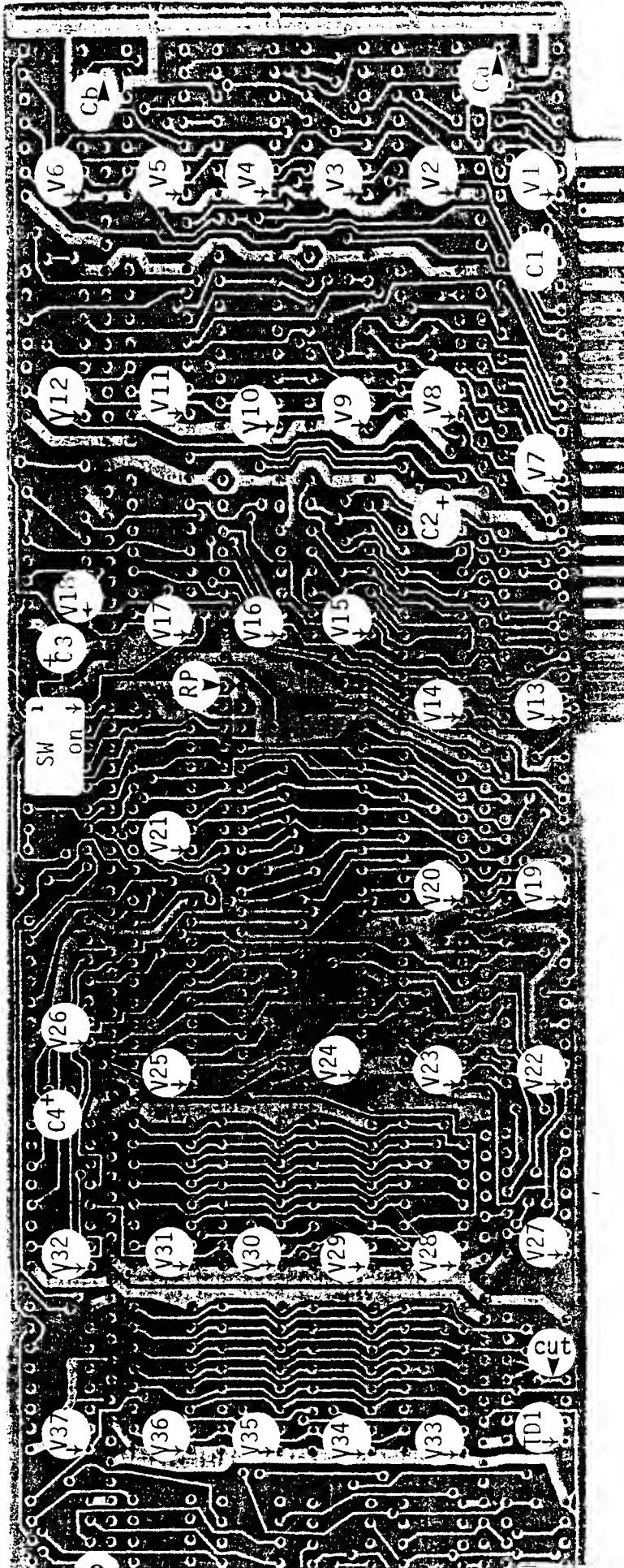
- ____ 1 - 7404 @ U7
- ____ 1 - 7410 @ U3
- ____ 2 - 7474 @ U4,5
- ____ 1 - 74107 @ U1
- ____ 1 - 74125 @ U2
- ____ 2 - 74LS245 @ U9,10
- ____ 1 - 74LS374 @ U8
- ____ 1 - Z80A MPU @ U6
- ____ 1 - 28L22 PROM @ U11

NuScope
Associates



GUIDE 4-6

SPEEDY CARD: Uses the sofisticated 6502-C microprocessor to considerable increase the speed of the computer. With power off, install 1 in slot 1 to 7. Documentation available from the supplier. Modification required.



Layout is magnified. Actual size is 20.2 x 8.0 cm

*INDICATES A PRECAUTION *MODIFICATION REQUIRED ON COMPONENT SIDE UNDER TD1

Match pin 1 of sockets with 1 - 2.2 k Ω 10-pin SIP bussed @ RP 1 (arrow) on the layout. *Match pin 1 of SIP with pin 1 (arrow) on the layout

SWITCH 1 - 8-position DIP @ SW *Note the "on" position

CAPACITORS C 1 - 0.1 μ F Monolithic @ C1 3 - 4.7 μ F/16V Tantalum* @ C2,3,4 *Match + of Tantalum with + on the layout

INTEGRATED CIRCUITS 1 - 74LS00 @ V6,18 2 - 74LS02 @ V11,43 2 - 74LS08 @ V12,26 1 - 74LS10 @ V3 1 - 74LS14 @ V8 1 - 74LS32 @ V5

40-pin @ V24 20-pin @ V7,13,14,25 16-pin @ V9,10,15,16,17,19,20, V21,22,23,28,29,30,31, V32,33,34,35,36,37 14-pin @ V1,2,3,4,5,6,8,11,12, V18,26,27,38,39,40,41, V42,43



SPEEDY CARD (continued)

ITED CIRCUITS (continued)

- 74LS74 @ V1,2,4,38,39,40
- 74LS80 @ V41 : 74LS86
- 74LS153 @ V21
- 74LS158 @ V19,20,22,23
- 74LS161 @ V10
- 74LS175 @ V32
- 74LS259 @ V17
- 74LS367 @ V15,16
- 74LS373 @ V7,13,14,25
- 74LS393 @ V27,42

- 4040 @ V37

- 24S10 PROM @ V9
- G655CO2P1-2 MPU @ V24
- 4164 RAM 150 ns @ V28,29,30,31
- V33,34,35,36

LINE

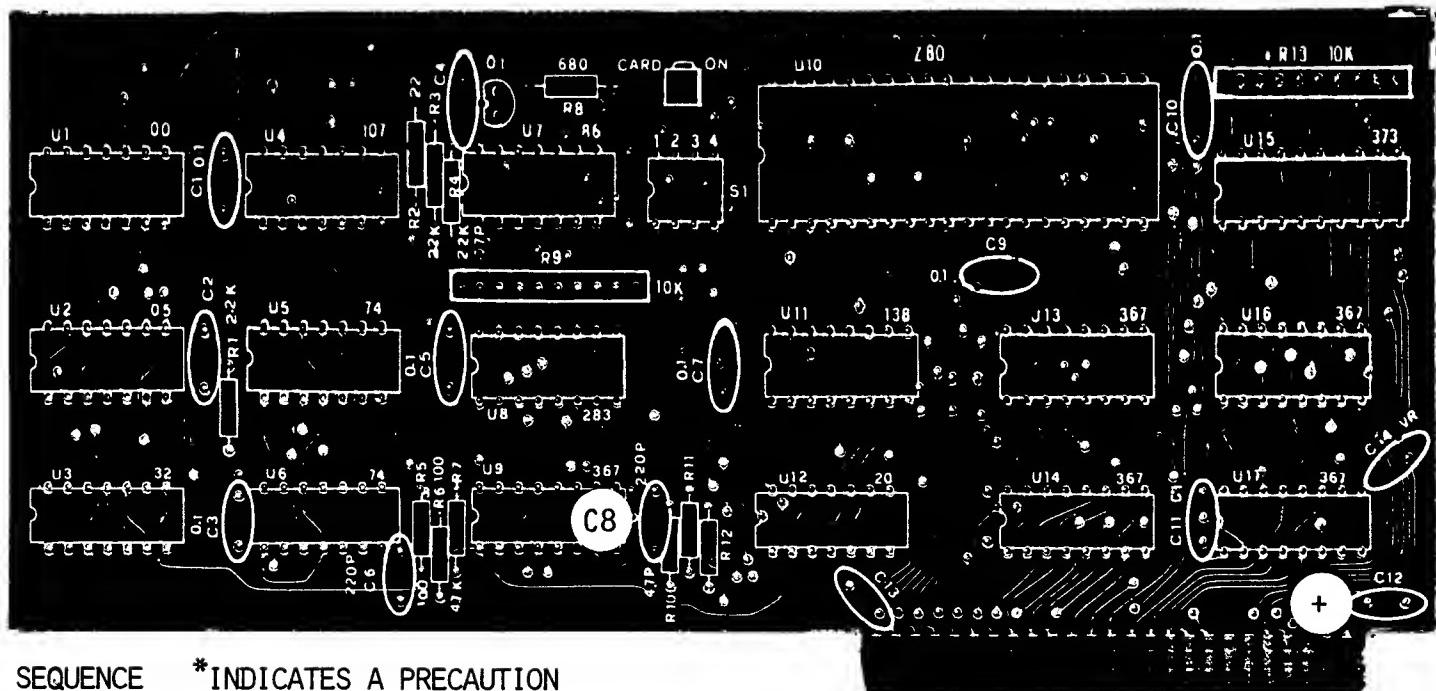
- TTLDM-100 100 ns @ TDI

LOCATION ON COMPONENT SIDE:

- cut trace from pin 4 of TTLDM-11 as shown on the layout

GUIDE 4-7

ACE Z-80: Allows one to run software written for the Z-80 based MPU (CP/M operating system). With power off, install in slot 4.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

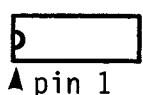
- 1 - 22 Ω @ R2
- 4 - 100 Ω @ R5,6,11,12
- 1 - 220 Ω @ R3
- 1 - 680 Ω @ R8
- 1 - 1.2 K Ω @ R4
- 1 - 2.2 K Ω @ R1
- 2 - 4.7 K Ω @ R7,10
- 2 - 10 K Ω 10-pin SIP* bussed @ R9,13
*Match pin 1 of SIP with pin 1 (arrow) on the layout

CAPACITORS C

- 1 - 50 pF @ C4
- 3 - 200 pF @ C6,8,14
- 9 - 0.1 μ F Monolithic @ C1,2,3,5,6,
@ C7,9,10,11,13
- 1 - 10 μ F/16V Tantalum* @ C12
*Match + of Tantalum
with + on the layout

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 8 - 14-pin
- 7 - 16-pin
- 1 - 20-pin
- 1 - 40-pin



TRANSISTORS Q *Position EBC leads as shown

- 1 - 2N3904 @ Q1

B D E
C

LIGHT EMITTING DIODE LED

- 1 - LED @ CARD ON *Position longer lead (+) with + on the layout

SWITCH

- 1 - 4-position DIP @ S1
Functions: 1-address offset when off
2-Z80 DMA when off
3-non-mask int when off
4-Z-80 interrupts when off

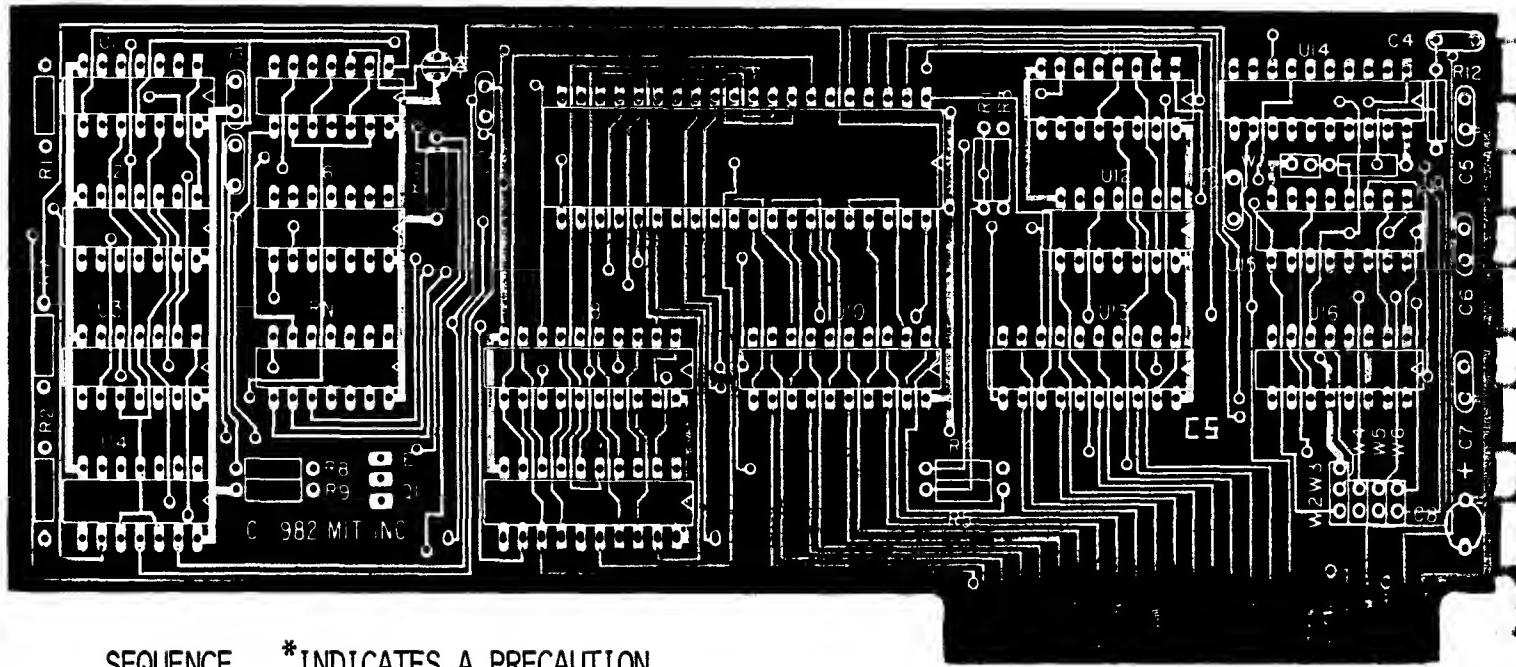
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS00 @ U1
- 1 - 74LS05 @ U2
- 1 - 74LS32 @ U3
- 1 - 74LS20 @ U12
- 2 - 74LS74 @ U5,6
- 1 - 74LS86 @ U7
- 1 - 74LS107 @ U4
- 1 - 74LS138 @ U11
- 1 - 74LS283 @ U8
- 5 - 74LS367 @ U9,13,14,16,17
- 1 - 74LS373 @ U15
- 1 - Z80A @ U10



GUIDE 4-8

EXCEL Z80 CARD: Allows one to use the CP/M operating system with the Z80 microprocessor installed. With power off, install in slot 4.



**SEQUENCE *INDICATES A PRECAUTION
MODIFICATION REQUIRED ON THE SOLDER SIDE**

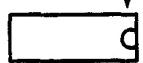
RESISTORS R $\frac{1}{2}$ watt, 5%

- 1 - 30 Ω @ R9
- 4 - 100 Ω @ R4,5,11,12
- 1 - 220 Ω @ R8
- 1 - 560 Ω @ R7
- 1 - 1.2 K Ω @ R1
- 1 - 1.5 K Ω @ R10
- 3 - 2 K Ω @ R2,3,6
- 1 - 10 K Ω 14-pin DIP @ RN

SOCKETS *Match pin 1 of sockets with pin

1 on the layout. Check that ALL pins have passed thru ALL holes

- 8 - 14-pin
- 3 - 16-pin
- 5 - 20-pin
- 1 - 40-pin



CAPACITORS C

- 1 - 22 pF @ C3
- 1 - 47 pF @ C9
- 1 - 100 pF @ C4
- 5 - 0.1 μ F Monolithic @ C1,2,5,6,7
- 1 - 10 μ F/16V Tantalum* @ C8

*Match + of Tantalum with + on the layout

TRANSISTOR Q *Match ebc transistor leads with ebc on the layout

- 1 - 2N3906 @ Q1

LIGHT EMITTING DIODE LED *Position cathode of diode toward the arrow

- 1 - LED @

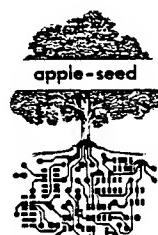
HEADERS male, straight

- 4 - 1x2 @ W1,W4,W5,W6
- 1 - 1x3 @ W2W3

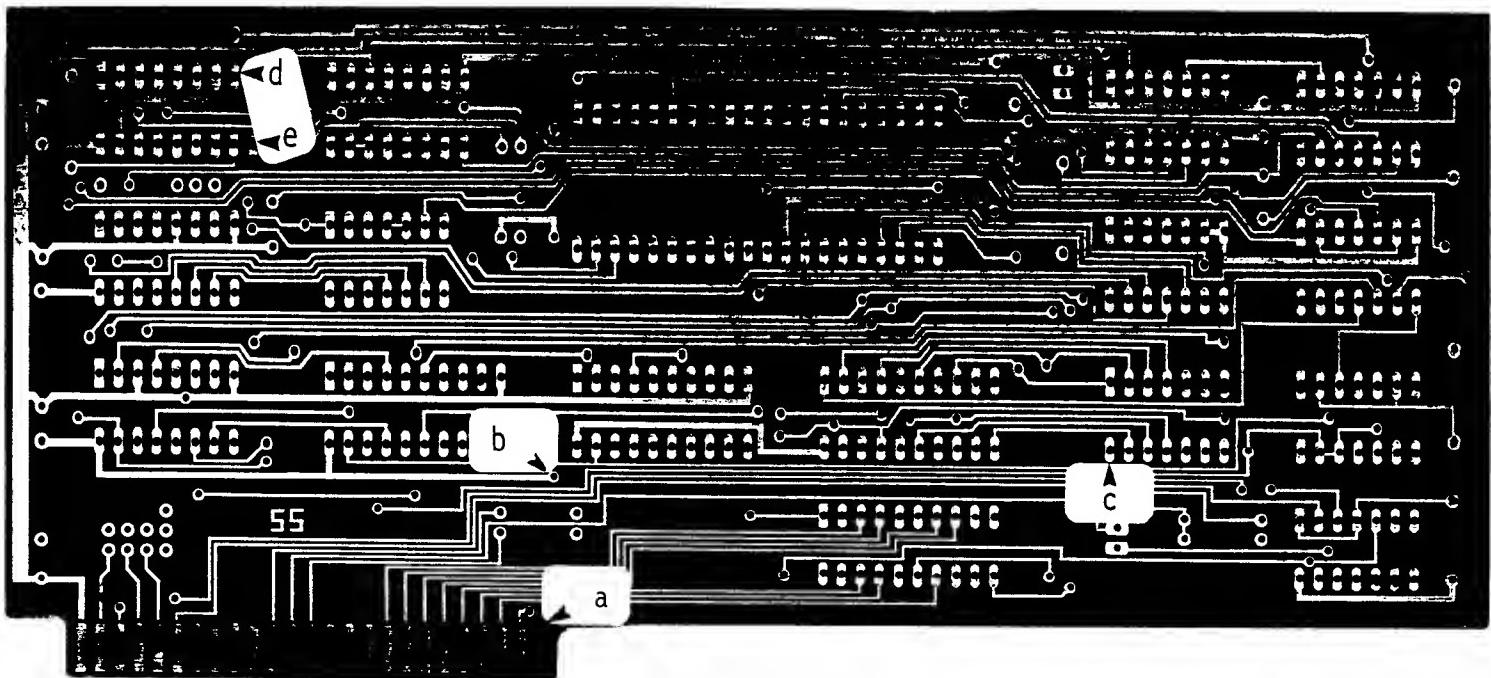
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS04 @ U1
- 2 - 74LS05 @ U5,15
- 1 - 74LS08 @ U6
- 1 - 74LS10 @ U12
- 1 - 74LS32 @ U2
- 2 - 74LS74 @ U3,14
- 1 - 74LS112 @ U11
- 4 - 74LS244 @ U8,10,13,14
- 1 - 74LS283 @ U16
- 1 - 74LS373 @ U9
- 1 - Z80 MPU @ U7

NuScope
Associates



EXCEL Z80 CARD: (continued)



MODIFICATIONS ON THE SOLDER SIDE Refer to the preceding layout

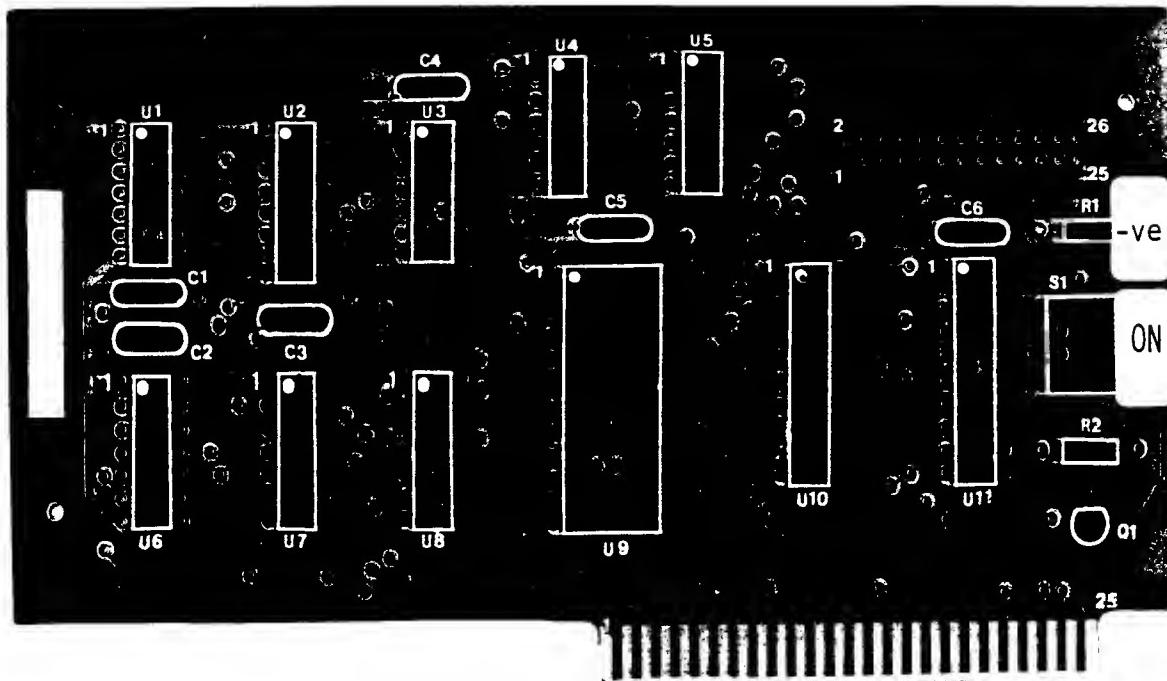
- 1 - Install one 0.1 μF Monolithic capacitor between "a" pin 50 (+12V) of card edge connector to "b" plate-thru hole.
- 2 - Strap "b" plate-thru hole to "c" pin 14 of RN.
- 3 - Strap "d" pin 8 of U14 to "e" pin 12 of U14.

MODIFICATION ON THE COMPONENT SIDE

- 1 - Bend out pin 12 - NOT USED - of U14.

GUIDE 5-1

PARALLEL PRINTER CARD: Centronics compatible parallel interface featuring advanced text features and HIRES dot graphics. Requires firmware (one EPROM). With power off, install in slot number 1.



SEQUENCE * INDICATES A PRECAUTION

DIODE D *Position banded end (cathode, -ve) of diode as shown on the layout
 _____ 1 - 1N4001 @ R1 *Error on layout

RESISTORS R $\frac{1}{4}$ watt, 5%
 _____ 1 - 4.7 K Ω @ R2

SOCKETS *Match pin 1 of sockets with pin 1 (white dot) on the layout. Check that ALL pins have passed thru ALL holes
 _____ 7 - 14-pin
 _____ 1 - 16-pin
 _____ 2 - 20-pin
 _____ 1 - 24-pin

CAPACITORS C
 _____ 1 - 100 pF disc ceramic @ C1
 _____ 1 - 470 pF disc ceramic @ C3
 _____ 4 - 0.1 μ F Monolithic @ C2,4,5,6

TRANSISTOR Q *Match the EBC transistor leads as shown
 _____ 1 - 2N3904



CONNECTOR

_____ 1 - 2x13 male header strip, right angle

SWITCH

_____ 1 - 4-position DIP @ S1

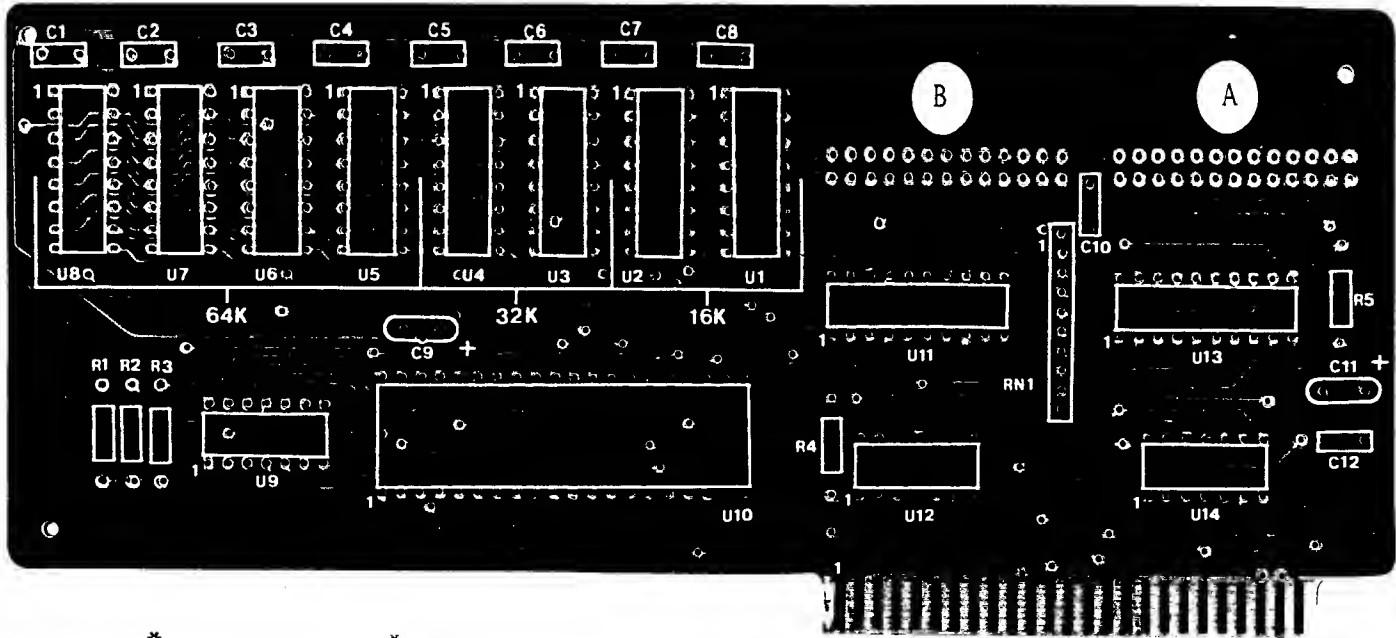
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- _____ 3 - 74LS00 @ U1,4,6 pin 1 \rightarrow 1
- _____ 1 - 74LS02 @ U3 upper left for
- _____ 1 - 74LS08 @ U7 ALL sockets
- _____ 1 - 74LS30 @ U8 & ICs
- _____ 1 - 74LS74 @ U5
- _____ 1 - 74LS279 @ U2
- _____ 2 - 74LS373 @ U10,11
- _____ 1 - 2732 EPROM @ U9



GUIDE 5-2

PRINTER BUFFER CARD: Adds memory - 16K, 32K, or 64K RAM - to your current parallel printer interface. With power off, connect by means of an appropriate cable, to your existing printer card; install in slot adjacent to printer card. Requires firmware (one EPROM).



SEQUENCE *A PRECAUTION *DO MODIFICATIONS FIRST

RESISTORS R $\frac{1}{4}$ watt, 5%

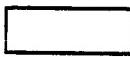
— 5 - 4.6 K Ω @ R1,2,3,4,5

— 1 - 4.7 K Ω 9-pin SIP @ RN 1*

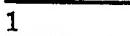
*Match pin 1 (common) of SIP with
pin 1 of RN 1 on the layout

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

— 3 - 14-pin



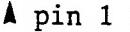
— 8 - 16-pin



— 2 - 20-pin



— 1 - 40-pin



▲ pin 1 for ALL
sockets & ICs

CAPACITORS C

— 10 - 0.1 μ F Monolithic @ C1,2,3,4,5,6,
C7,8,10,12

— 1 - 2.2 μ F/25v Radial* @ C9

— 1 - 100 μ F/16v Radial* @ C11
*Match + of capacitors
with + on layout

MODIFICATIONS *On the COMPONENT SIDE

— 7 - Cuts: Cut the trace from pin 14
to pin 14 of: U1-2; U2-3; U3-4;
U4-5; U5-6; U6-7; U7-8

CONNECTORS

— 2 - 2x13 male header strip, right-angle

INTEGRATED CIRCUITS *Match pin 1 of IC
with pin 1 on the layout

— 1 - 74LS32 @ U14

— 1 - 74LS74 @ U12

— 2 - 74LS374 @ U11,13

— 1 - 74LS38 @ U9

— 1 - D8748 8-bit CPU, 4K EPROM
(8048) @ U10

— 8 - 4564 RAM

@ U1,2 for 16K RAM

@ U1 to 4 for 32K RAM

@ U1 to 8 for 64K RAM

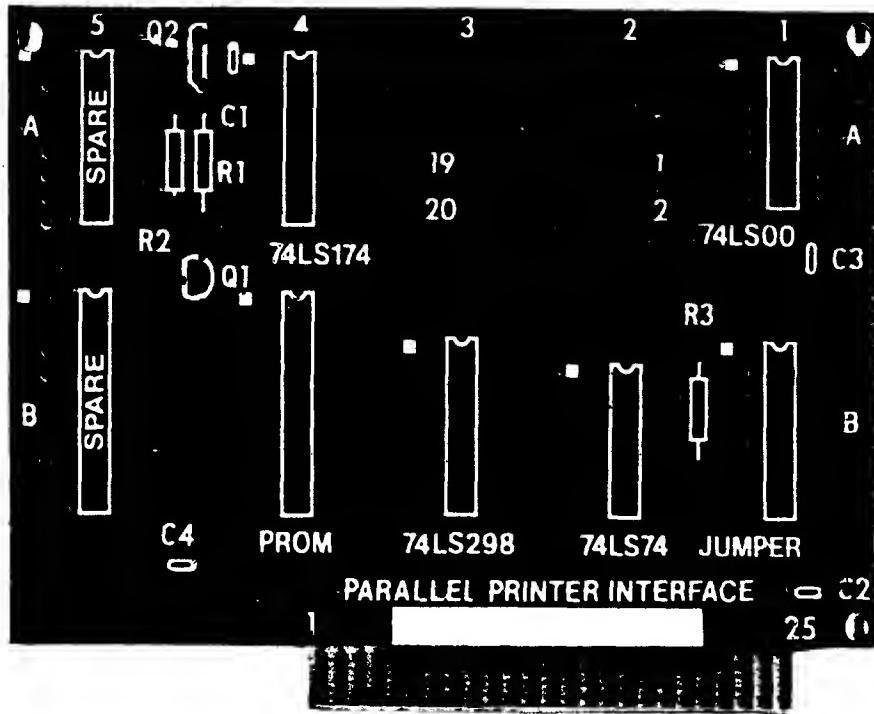
RIBBON CABLE CONNECTOR

— 1 - 10-12 cm length, 26-conductor, with
connectors @ each end to connect buffer-
board from A on the layout to printer
interface card. Use existing printer
cable to connect bufferboard from B on
the layout to the printer



GUIDE 5-3

PARALLEL PRINTER INTERFACE CARD: Allows one to produce printed output (hardcopy) on a variety of printers; may also be used as a general purpose output card to drive music synthesizers, analog-to-digital converters, etc. With power off, install in slot number 1. Requires firmware (one PROM).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 150 Ω @ R1
- 1 - 68 Ω @ R2
- 1 - 12 K Ω @ R3

CAPACITORS C

- 4 - 0.1 μ F @ C1,2,3,4

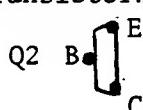
SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins of sockets have passed thru ALL holes

- 2 - 14-pin pin 1 →
- 3 - 16-pin
- 1 - 20-pin

TRANSISTORS Q *Install EBC leads as shown

- 1 - 2N3904 @ Q1
- 1 - MPSU51 @ Q2

*Check with supplier re EBC leads of transistors



INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 on layout

- 1 - 74LS00
- 1 - 74LS74
- 1 - 74LS174
- 1 - 74LS298
- 1 - 6309 PROM

CONNECTOR

- 1 - 2x10 male header strip, right-angle
- *Position pins UP
- 1 - ribbon cable with appropriate connectors

JUMPER

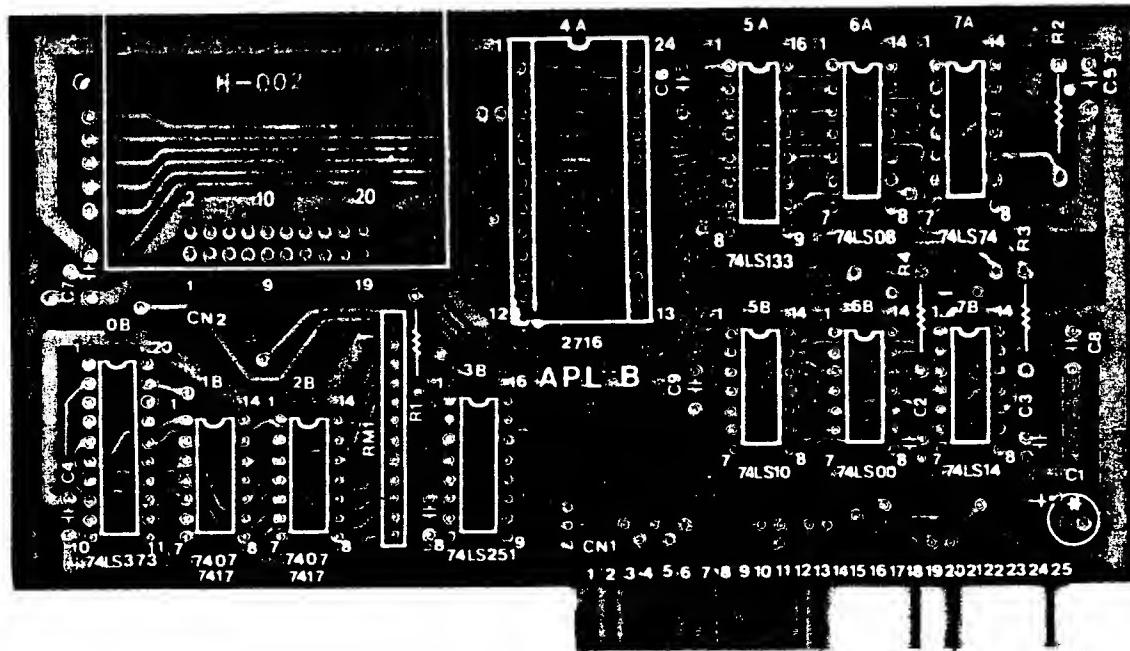
- 1 - 16-pin DIP header
- 1 - jumper block

NOTE: The pin-out of the ribbon cable and the wiring of the jumper block must be customized for your specific printer. Refer to the appropriate printer interface card installation manual

GUIDE 5-4

EPSON/CENTRONICS INTERFACE CARD: Allows interface to parallel printers.

With power off, install in slot number 1. Requires firmware (one EPROM).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

— 2 - 12 K Ω @ R1,2
— 2 - 100 Ω @ R3,4

— 1 - 1 K Ω 11-pin SIP @ RM1

*Pin 1 of SIP is labelled "1"
on the layout

CAPACITORS C

— 1 - 10 μ F/16v Tantalum* @ C1
*Match + of capacitor with
+ on the layout
— 2 - 0.001 μ F @ C2,3
— 7 - 0.1 μ F Monolithic @ C4 to C10
*C10 is NOT labelled on the layout
and is located between the SIP and
the 74LS251 IC

SOCKETS *Match pin 1 of sockets with pin 1
on the layout. Check that ALL
pins have passed thru ALL holes

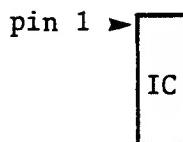
— 7 - 14-pin pin 1 → 
— 2 - 16-pin
— 1 - 20-pin
— 1 - 24-pin

CONNECTOR

— 1 - 2x10 male header strip, right angle
*Position pins UP

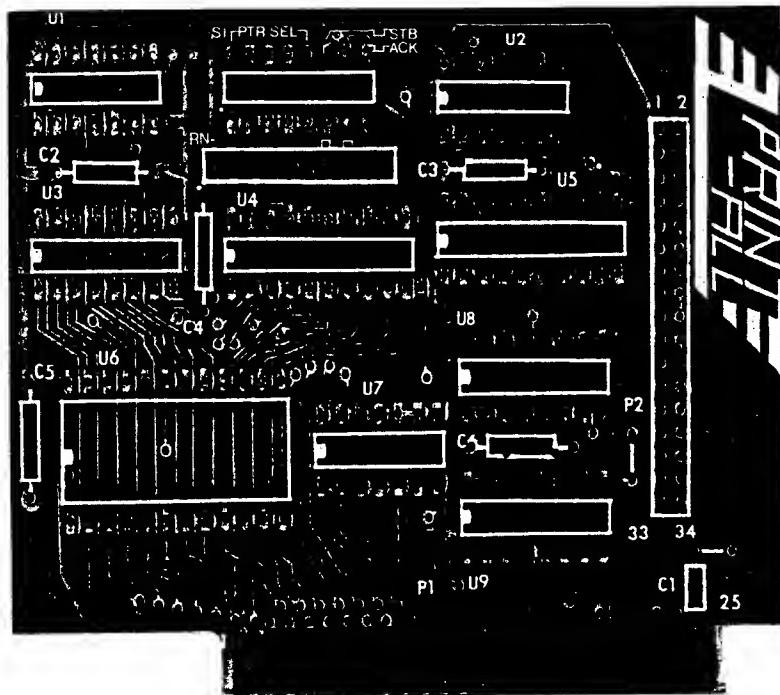
INTEGRATED CIRCUITS *Match pin 1 of IC
with pin 1 on the layout

— 1 - 74LS00
— 2 - 74LS07
— 1 - 74LS08
— 1 - 74LS10
— 1 - 74LS14
— 1 - 74LS74
— 1 - 74LS133
— 1 - 74LS14
— 1 - 74LS251
— 1 - 74LS373
— 1 - 2716 EPROM



GUIDE 5-5

PRINT-ALL CARD: Parallel printer interface card for text and graphics applications. With power off, install in slot number 1 (recommended). Requires firmware (one EPROM).



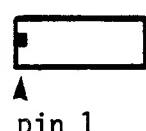
SUGGESTED SEQUENCE *INDICATES A PRECAUTION

RESISTORS: R $\frac{1}{4}$ watt, 5%

____ 1 - 2K-10 K Ω 10-pin SIP resistor @ RN

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- ____ 3 - 14-pin
- ____ 3 - 16-pin
- ____ 2 - 20-pin
- ____ 1 - 24-pin



CAPACITORS C

____ 1 - 33 μ F/16v Radial* @ C1

*Match + of capacitor as shown



____ 5 - 0.1 μ F Monolithic @ C2,3,4,5,6

SWITCH SW

____ 1 - 8-position DIP @ SW1

Set switches as per printer instructions

CONNECTOR

____ 1 - 2x17 header strip, straight @ P2

CABLE

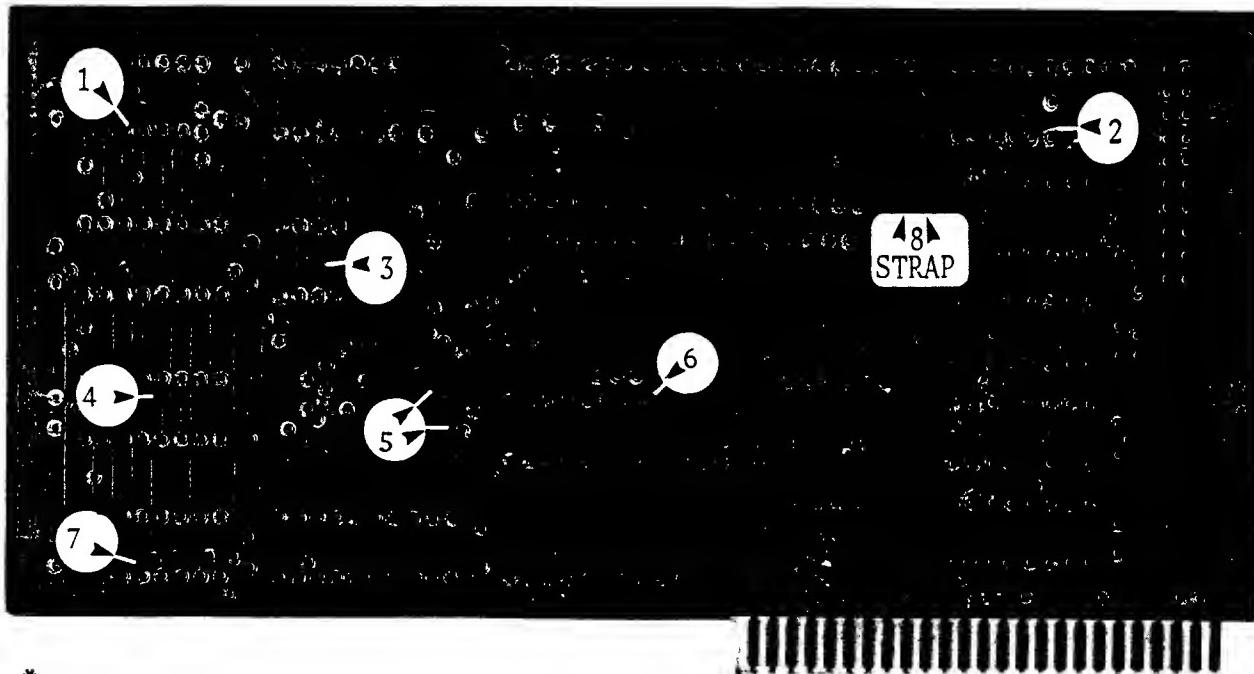
____ 1 - as per printer

INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 on the layout

- ____ 1 - 74LS02 @ U1
- ____ 1 - 74LS08 @ U7
- ____ 1 - 74LS86 @ U2
- ____ 1 - 74LS133 @ U3
- ____ 1 - 74LS138 @ U9
- ____ 1 - 74LS244 @ U4 pin 1
- ____ 1 - 74LS273 @ U5
- ____ 1 - 74LS279 @ U8
- ____ 1 - 2732 EPROM @ U6

GUIDE 5-6

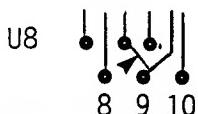
MICRO-2-BUFFER: Centronics-compatible parallel printer interface featuring up to 32 K bytes of data buffering and advanced HIRES dump routines. Allows computer to simultaneously print and process. Requires firmware (two EPROMs). With power off, install in any slot except \emptyset (slot # 1 recommended). Modifications required.



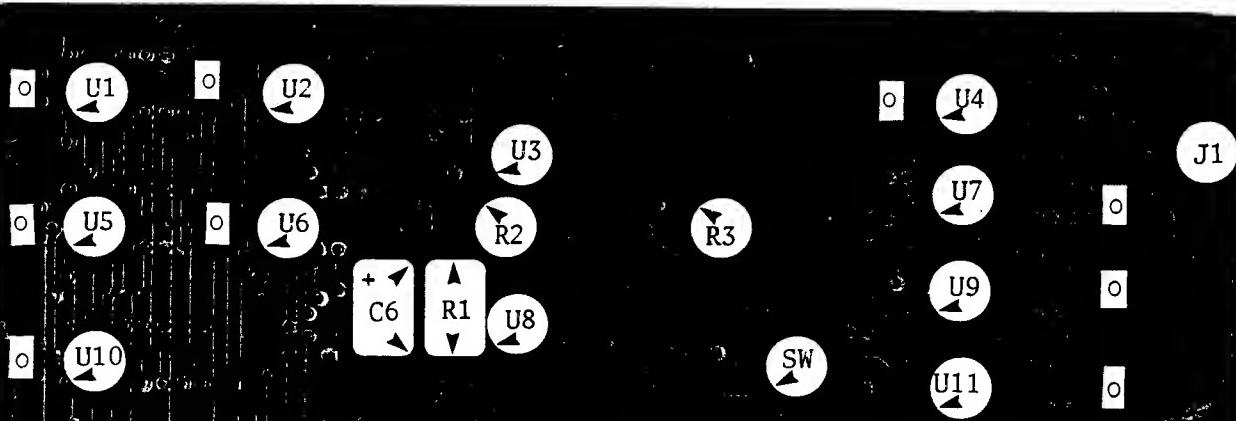
*MODIFICATIONS REQUIRED

ON THE COMPONENT SIDE. The following numbers refer to the numbers on the layout

- 1 cut trace directly above pin 2 of U1
- 2 cut trace between pin 7 of U4 & the feed-thru hole located directly above
- 3 cut trace directly above pin 4 of U6
- 4 cut trace connecting pin 4 of U10 to pin 13 of U10
- 5 isolate the -ve solder pad of C6 by making two cuts on either side
- 6 cut trace directly above pin 9 of U8



- 7 cut trace directly above pin 3 of U12
- 8 strap two feed-thru holes as shown



MICRO-2-BUFFER (continued)

SEQUENCE *INDICATES A PRECAUTION

RESISTORS $\frac{1}{4}$ watt, 5%

— 1 - 470 Ω @ R1

— 2 - 10 K Ω 10-pin SIP* bussed @ R2,3

*Match pin 1 of SIPs with pin 1
(arrow) on the layout

SOCKETS Match pin 1 of sockets with pin
1 (arrow) on the layout. Check that
ALL pins have passed thru ALL holes

— 4 - 14-pin @ U1,2,6,15

— 7 - 16-pin @ U5,7,9,10, 11,12,16

— 2 - 20-pin @ U4,13

— 2 - 24-pin @ U8,14

— 1 - 40-pin @ U3

CAPACITORS C

— 13 - 0.1 F Monolithic @ 0

— 1 - 22 F/50V Axial* @ C6

*Match + of Axial
with + on the layout

HEADER

— 1 - 2x10 male, straight, @ J1

SWITCH -

— 1 - 6-position DIP @ SW

INTEGRATED CIRCUITS *Match pin 1 of ICs
with pin 1 on the layout

— 1 - 74LS00 @ U1

— 1 - 74LS30 @ U15

— 1 - 74LS74 @ U2

— 1 - 74LS132 @ U6

— 1 - 74LS139 @ U12

— 1 - 74LS279 @ U5

— 1 - 74LS368 @ U10

— 2 - 74LS374 @ U4,13

— 1 - 1802 @ U3

— 4 - 4164 64Kx1 dynamic RAM

@ U7,9,11,16

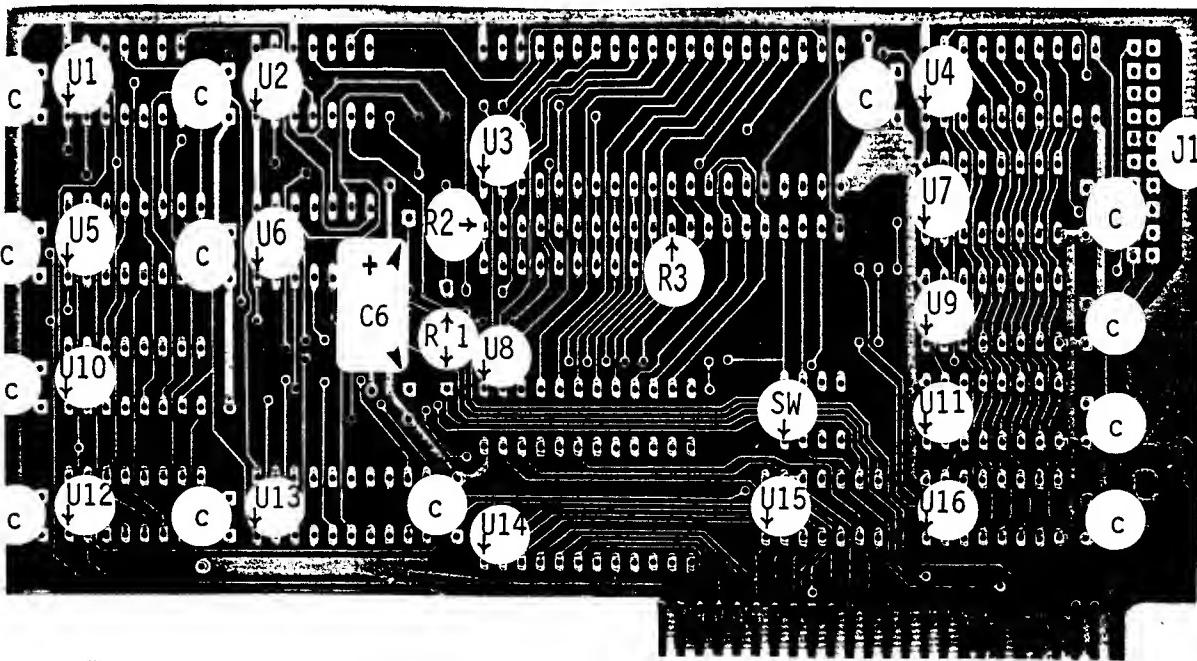
— 2 - 2716 EPROM @ U8,14

SWITCH SETTINGS

SWITCH	OFF	ON
1	40 column default/video on	80 column default/ video off
2	keyboard reset has no effect	keyboard reset clears buffer
3,4	not used	not used
5	32 K buffer	16 K buffer
6	buffer enabled	buffer disabled

GUIDE 5-7

PRELUDE 32 K PRINTER/BUFFERED CARD: Centronics-compatible parallel printer interface with 32 K bytes of data buffering, and advanced HIRES dump routines. Allows computer to simultaneously print and process. Requires firmware (two EPROMs). With power off, install in any slot except \emptyset (slot 1 recommended). Modifications required on the solder side .



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 470 Ω @ R1
- 2 - 10 K Ω 10-pin SIP* bussed @ R2,3
*Match pin 1 of SIPs with pin 1 (arrow) on the layout

SOCKETS *Match pin 1 of sockets with pin 1 (arrow) on the layout. Check that ALL pins have passed thru ALL holes

- 4 - 14-pin @ U1,2,6,15
- 7 - 16-pin @ U5,7,9,10,11,12,16
- 2 - 20-pin @ U4,13
- 2 - 24-pin @ U8,14
- 1 - 40-pin @ U3

CAPACITORS C

- 13 - 0.1 μ F Monolithic @ c
- 1 - 22 μ F/50V Axial* @ C6
*Match + of axial with + on the layout

HEADER

- 1 - 2x10 male, straight @ J1

SWITCH

- 1 - 4-position DIP @ SW
*Arrow indicates switch 1

SWITCH SETTINGS SWITCH

		OFF	ON
1	40-column default/video on	80-column default/video off	
2	keyboard reset has no effect	keyboard reset clears buffer	

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS00 @ U1
- 1 - 74LS30 @ U15
- 1 - 74LS74 @ U2
- 1 - 74LS132 @ U6
- 1 - 74LS139 @ U12
- 1 - 74LS279 @ U5
- 1 - 74LS368 @ U10
- 2 - 74LS374 @ U4,13
- 1 - 1802 @ U3
- 4 - 4164 RAM @ U7,9,11,16
- 2 - 2716 EPROM @ U8,14

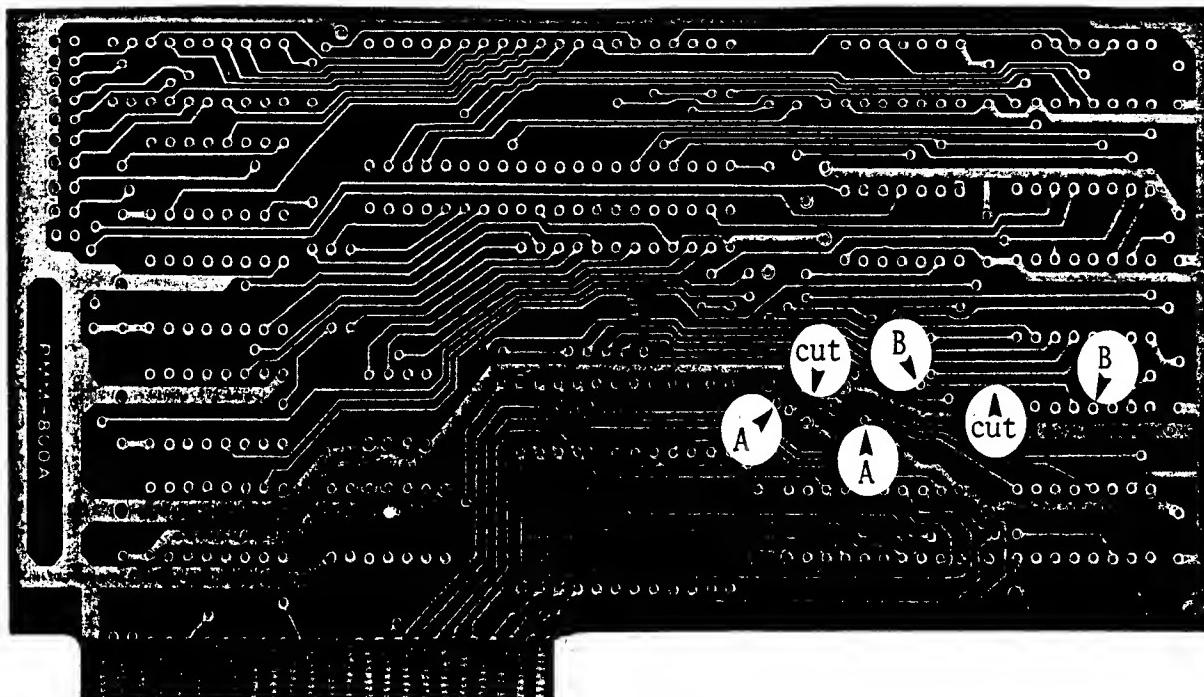


PRELUDE 32 K PRINTER/BUFFERED CARD (continued)

*MODIFICATION REQUIRED ON THE SOLDER SIDE as shown on the layout below

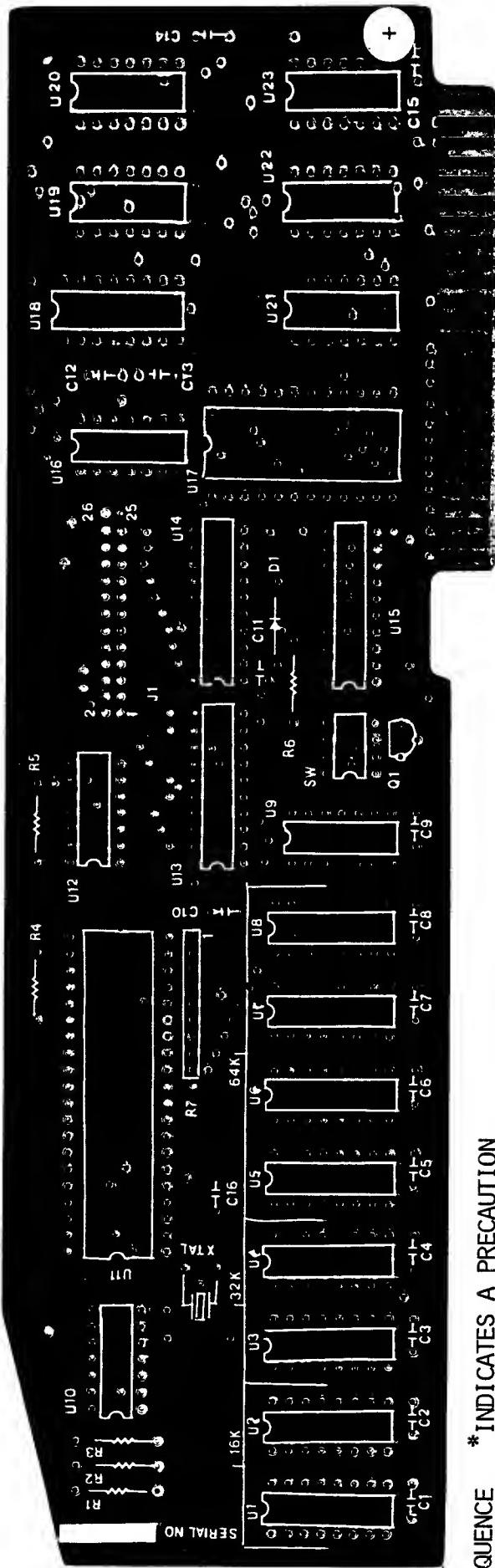
Make two cuts

Strap A to A and B to B



GUIDE 5-8

PRINTER BUFFER: Centronics-compatible parallel printer interface with up to 64 K RAM of buffered memory. With power off, install in slot 1. Requires firmware (one EPROM).



*INDICATES A PRECAUTION

DIODE *Position banded end of diode towards the arrow
1 - 1N4148 @ D1

CAPACITORS C
1 - 47 pF
1 - 100 pF

RESISTORS R $\frac{1}{4}$ watt, 5%
6 - 4.7 k Ω @ R1,2,3,4,5,6
1 - 10 k Ω 9-pin SIP bussed @ R7
*Match pin 1 of SIP with pin 1 on the layout

CONNECTOR
1 - 2x13 header, male, straight @ J1
INTEGRATED CIRCUITS
with pin 1 on the layout
3 - 74LS00 @ U16,19,23
1 - 74LS02 @ U20
1 - 74LS08 @ U22
1 - 74LS30 @ U21
1 - 74LS32 @ U9
TRANSISTOR Q Match ebc leads as shown
on the layout
1 - 2N3904 @ Q1

SOCKETS
*Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

14-pin
9 - 16-pin
9 - 20-pin
3 - 24-pin
1 - 40-pin

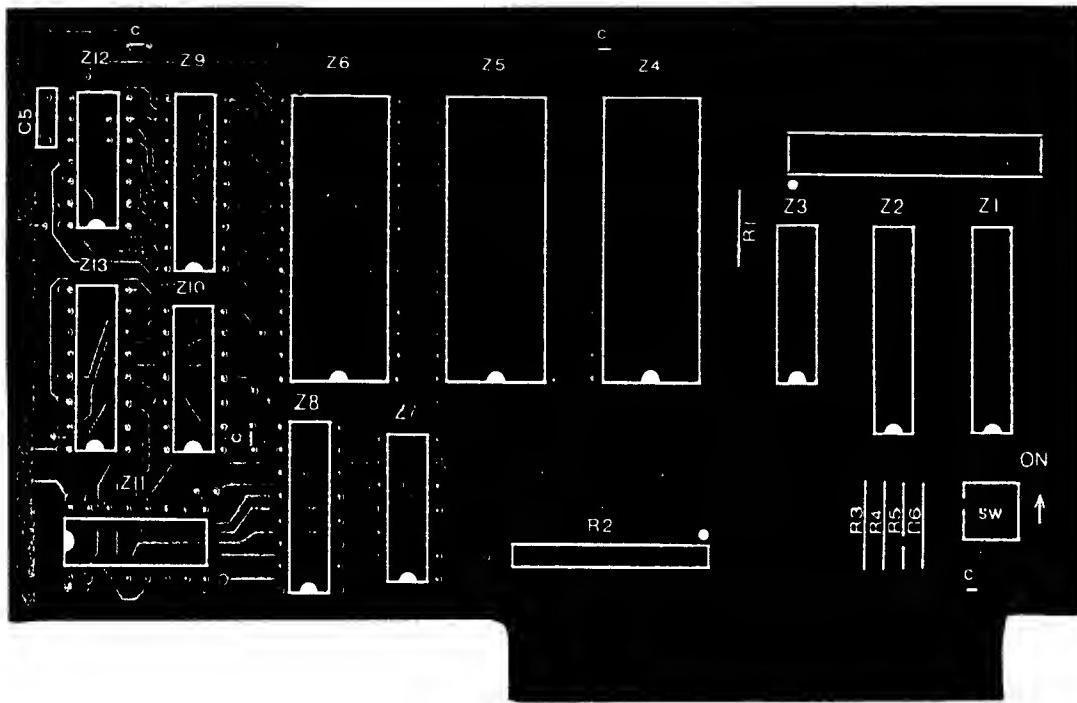
SWITCH
1 - 4-position DIP @ SW
CRYSTAL Y *Not required

RAM
8 - 4164 RAM @ U1 to U8



GUIDE 5-9

COLLEGE NICE PRINT CARD: Precision printer card that supports Epson & Gemini dot-matrix printers to produce normal & near-letter quality print. Has a) optional font styles (may be italicized); six pitches 5 to 17 in Pica, Elite, Condensed; and underline, boldface, subscript & superscript. With power off, install in slot 1. Documentation available from supplier. Requires firmware (one EPROM).



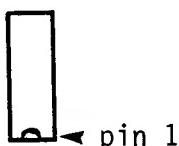
SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{2}$ watt, 5%

- 5 - 3.3 K Ω @ R1,3,4,5,6
- 1 - 2.2 K Ω 10-pin SIP* bussed @ R2
- *Match pin 1 of SIP with pin 1 (white dot) on the layout

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 3 - 14-pin
- 4 - 16-pin
- 1 - 18-pin
- 2 - 20-pin
- 3 - 28-pin



CAPACITORS C

- 1 - 15 pF @ C5
- 4 - 0.1 μ F Monolithic @ C

SWITCH & SWITCH SETTINGS

- 1 - 4-position DIP @ SW

EPSON: 1,2,3,4 on

GEMINI: 1,2,4 on; 3 off

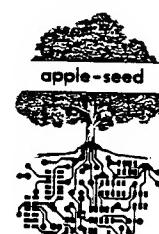
CONNECTORS

- 1 - 2x3 header, male, straight
- 1 - appropriate printer cable

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

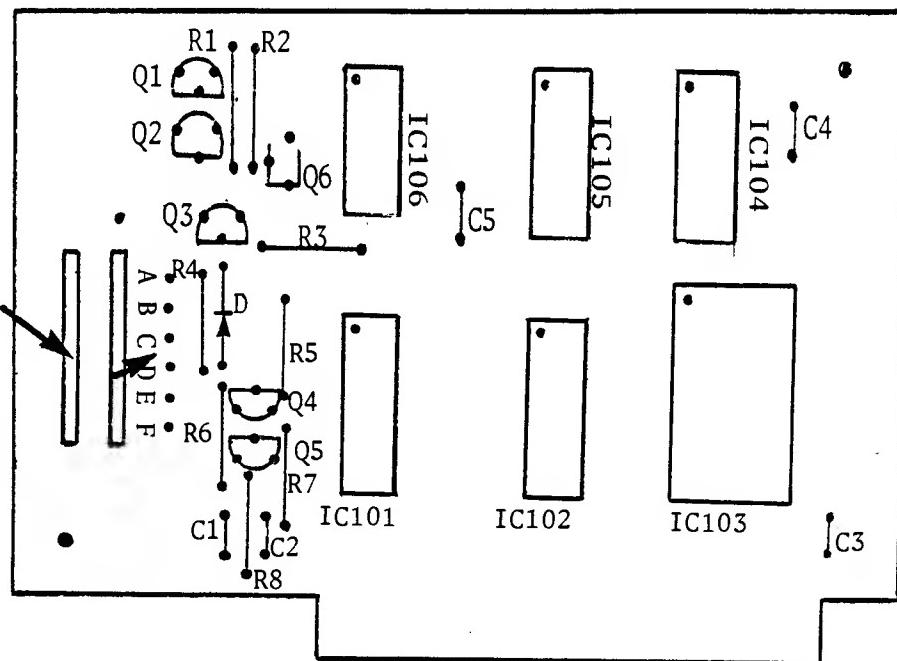
- 1 - 74LS00 @ Z7
- 1 - 74LS02 @ Z10
- 1 - 74LS30 @ Z12
- 2 - 74LS138 @ Z8,13
- 1 - 74LS174 @ Z11
- 1 - 74LS279 @ Z3
- 2 - 74LS374 @ Z1,2
- 1 - 2114 @ Z9
- 1 - 2764 EPROM @ Z4
- 2 - 2764 EPROM @ Z5,6 (optional)

NuScope
Associates



GUIDE 6-1

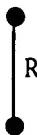
COMMUNICATIONS INTERFACE CARD: Bi-directional communication between the computer and external electronic devices such as printers, terminals, modems, other computers, etc. With power off, install in slot 1. Requires firmware (one EPROM).



SEQUENCE *INDICATES A PRECAUTION

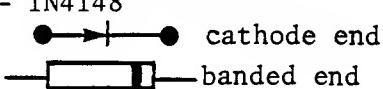
RESISTORS R $\frac{1}{4}$ watt, 5%

- 2 - 150 Ω @ R1,6
- 1 - 68 Ω @ R2
- 4 - 3.3 K Ω @ R3,4,5,8
- 1 - 10 K Ω @ R7



DIODE D *Position banded end (cathode) of diode as shown

- 1 - 1N4148

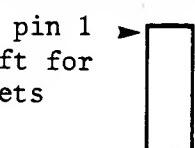


CAPACITORS C at

- 5 - 0.1 μ F Monolithic @ C1,2,3,4,5

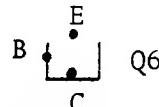
SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes.

- 2 - 10-pin
- 1 - 14-pin upper left for
- 2 - 16-pin ALL sockets
- 1 - 24-pin & ICs



TRANSISTORS Q *Position EBC leads as shown

- 3 - 2N3906 @ Q1,2,4
- 2 - 2N3904 @ Q3,5
- 1 - 2N4355 @ Q6



RIBBON CABLE: 6-wire with DB-25 connector Connect as follows:

PC Board	DB-25
A	1
B	2
C	3
D	4
E	7
F	8

INTEGRATED CIRCUITS IC *Match pin 1 of ICs with pin 1 on the layout

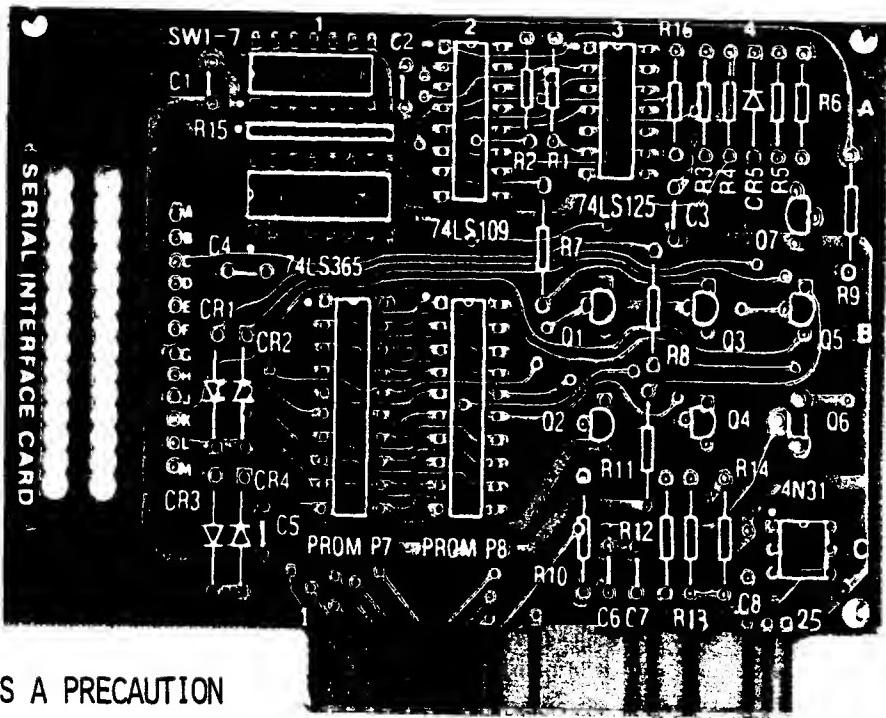
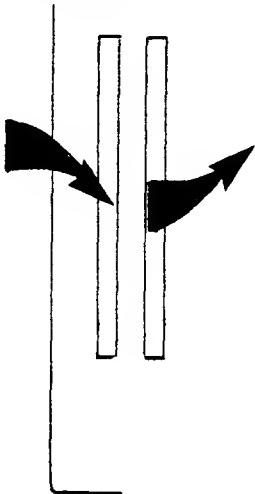
- 1 - 6309 PROM @ 101
- 1 - 74LS245 @ 102
- 1 - 6850 @ 103
- 2 - 74LS161 @ 104,105
- 1 - 74LS74 @ 106



GUIDE 6-2

SERIAL CARD: Allows serial communication (RS-232) to peripheral devices such as printer, modem. With power off, install in slot number 2. Requires firmware (two PROMS).

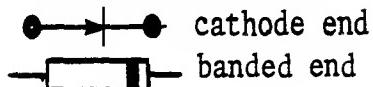
Secure ribbon cable
in this manner:



SEQUENCE

*INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diode as shown



— 5 - 1N4448 @ CR1,2,3,4,5

RESISTORS R $\frac{1}{4}$ watt, 5%

— 2 - 1 K Ω @ R1,16

— 6 - 3 K Ω @ R2,4,5,7,9,12

— 1 - 68 Ω @ R3

— 1 - 12 K Ω @ R6

— 2 - 390 Ω @ R8,14

— 1 - 150 Ω @ R10 — 1 - 2 K Ω @ R13

— 1 - 100 Ω @ R11

— 1 - 2.2 K Ω 8-pin SIP @ R15

*Pin 1 is indicated by a dot (•) on the layout

CAPACITORS C

— 8 - 0.1 μ F Monolithic @ C1,2,3,4,5,6,7,8

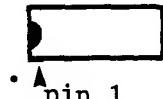
SOCKETS *Match pin 1 of sockets with pin 1 (white dot) on the layout. Check that ALL pins have passed thru ALL holes

— 1 - 6-pin

— 1 - 14-pin

— 2 - 16-pin

— 2 - 20-pin

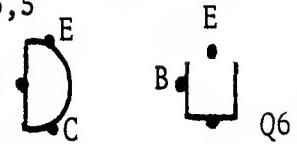


TRANSISTORS Q *Install 3 leads as shown

— 4 - 2N3906 @ Q1,2,3,5

— 2 - 2N3904 @ Q4,7

— 1 - MPSU51 @ Q6



*Check with supplier re EBC leads of transistor

SWITCH

— 1 - 7-position DIP switch

RIBBON CABLE 12-wire with DB-25 connector
Connect as follows

PC BOARD	DB-25	PC BOARD	DB-25
A	1	G	7
B	2	H	20
C	3	J	8
D	4	K	23
E	5	L	12
F	6	M	13

INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 (white dot) on the layout

— 1 - 74LS109

— 1 - 74LS125

— 1 - 74LS365

— 1 - 4N31

— 1 - 6309 PROM @ P7

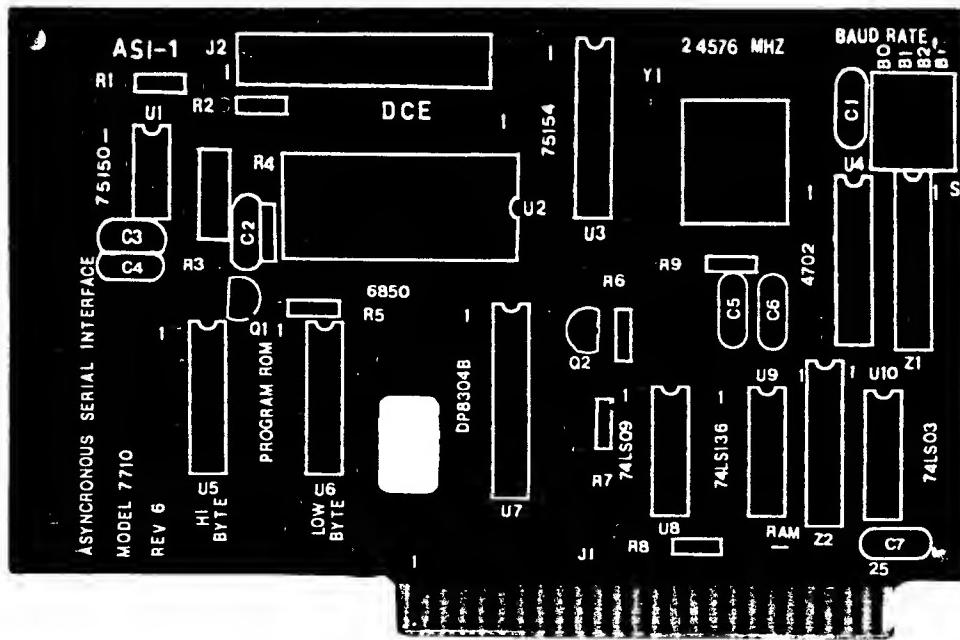
— 1 - 6349 PROM @ P8



pin 1

GUIDE 6-3

ASYNCHRONOUS SERIAL INTERFACE CARD: Allows user to interface the computer to peripheral devices including line printers, paper tape units, video terminals, as well as other computers. With power off, install in any slot except \emptyset (slot 2 recommended). Requires firmware (two PROMs).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5% (except R3)

- 1 - 10 Ω @ R1
- 4 - 220 Ω @ R4,5,6,7
- 1 - 680 Ω @ R2
- 1 - 2.7 K Ω @ R8
- 1 - 1 M Ω @ R9
- 2 - 2.7 K Ω 8-pin SIP @ Z1,2 *Match pin 1 of SIPs with pin 1 on the layout
- 1 - 100 Ω $\frac{1}{2}$ watt, 5% @ R3

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 1 - 8-pin
- 3 - 14-pin
- 4 - 16-pin
- 1 - 20-pin
- 1 - 24-pin

CAPACITORS C

- 2 - 56 pF, 500VDC, Mica @ C5,6
- 5 - 0.1 μ F Monolithic @ C1,2,3,4,7

SWITCH

- 1 - 4-position, DIP @ S1

CONNECTOR

- 1 - 2x13 male header strip, straight @ J2

TRANSISTOR Q *Position the EBC leads as shown



— 2 - 2N2907 @ Q1,2

CRYSTAL Y *Fold body of crystal flat against the card before soldering. Insulate

— 1 - 2.4576 MHz @ Y1

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 75150 @ U1
- 1 - 6850 @ U2
- 1 - 75154 @ U3
- 1 - 4702 (Fairchild) @ U4
- 1 - 8304B @ U7
- 1 - 74LS09 @ U8
- 1 - 74LS136 @ U9
- 1 - 74LS03 @ U10
- 2 - 82S129 PROMs @ U5,6

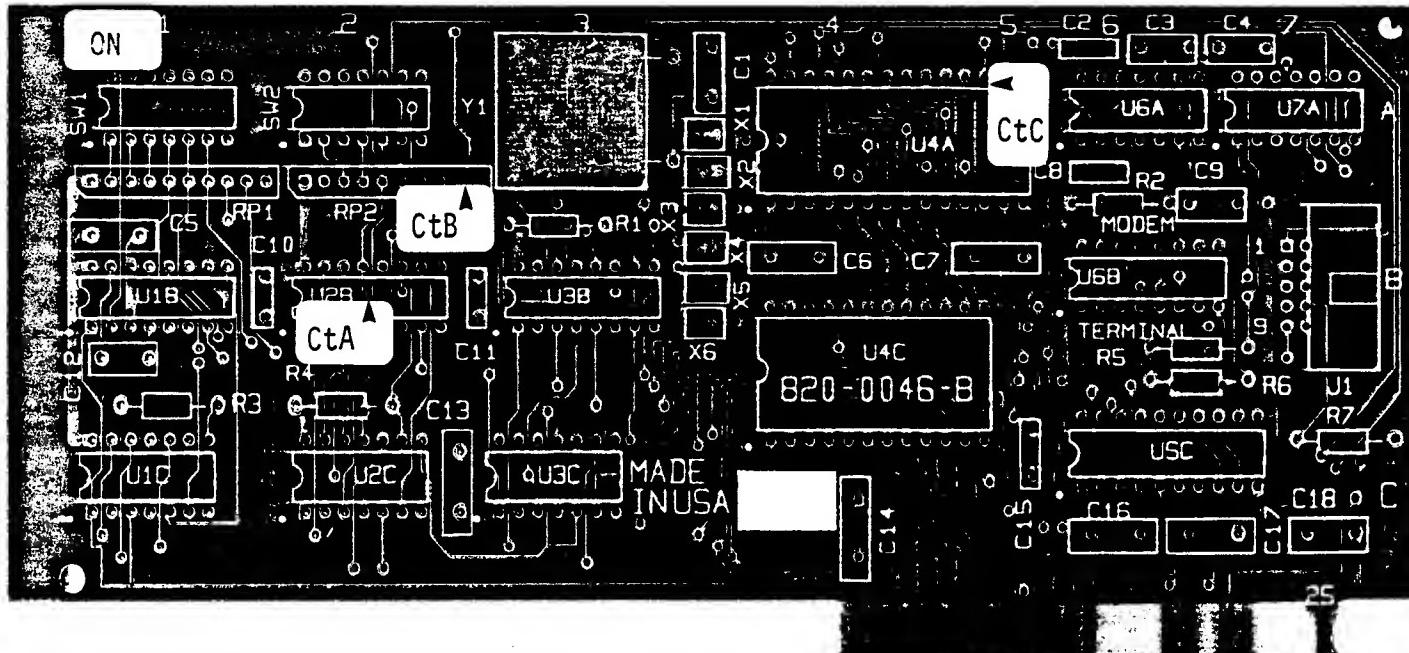
CABLE

— 1 - 26-conductor ribbon cable, 20 cm long, with DB25S connector at one end and a 26-pin female header at the other end



GUIDE 6-4

SUPRA-SERIAL: Allows computer to be used as a terminal or modem. With power off, install in any slot except \emptyset (slot 2 recommended). Requires firmware (one EPROM).



SEQUENCE *INDICATES A PERCAUTION

*MODIFICATIONS: Cut three traces on the component side as shown on the layout @ CtA, CtB, & CtC

RESISTORS R $\frac{1}{4}$ watt, 5%

3 - 100 Ω @ R3,4,7

1 - 3.3 K Ω @ R1

3 - 15 K Ω @ R2,5,6

2 - 3.3 K Ω 10-pin SIP @ RP1, RP2

*Match pin 1 of SIPs with pin 1 (square pad) on the layout

SOCKETS *Match pin 1 of sockets with pin 1 (white dot) on the layout. Check that ALL pins have passed thru ALL holes

7 - 14-pin .

2 - 16-pin pin 1 lower left
1 - 20-pin for ALL sockets

1 - 24-pin

1 - 28-pin

CAPACITORS C *Delete capacitor @ C1

1 - 220 pF @ C12

3 - 330 pF @ C3,4,9

1 - 0.001 μ F @ C18

7 - 0.01 μ F @ C5,6,7,13,14,16,17

5 - 0.1 μ F @ C2,8,10,11,15

SWITCHES

2 - 7-position DIP @ SW1,2

CRYSTAL Y

CONNECTOR

1 - 2x5 male header strip, 90°, @ J1

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 (white dot) on the layout

1 - 74LS00 @ U2C

1 - 74LS11 @ U1C

1 - 74LS32 @ U3C

1 - 74LS245 @ U5C pin 1

1 - 74LS279 @ U1B

2 - 74LS365 @ U2B, U3B

1 - 1488 @ U6A

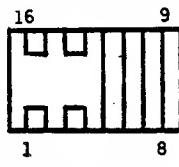
1 - 1489 @ U7A

1 - 6551 MPU, ACIA @ U4A

1 - 2716 EPROM @ U4C

PLUG-IN-ADAPTER one 16-pin component carrier strapped as shown to reconfigure socket @ U6B for either modem or terminal use

this end towards keyboard for terminal use



this end towards keyboard for modem use

RIBBON CABLE with appropriate connectors

Pin out for J1 includes:

CARD DB25	CARD DB25
-----------	-----------

1	1
---	---

2	2
---	---

3	3
---	---

4	4
---	---

5	5
---	---

6	6
---	---

7	19
---	----

8	7
---	---

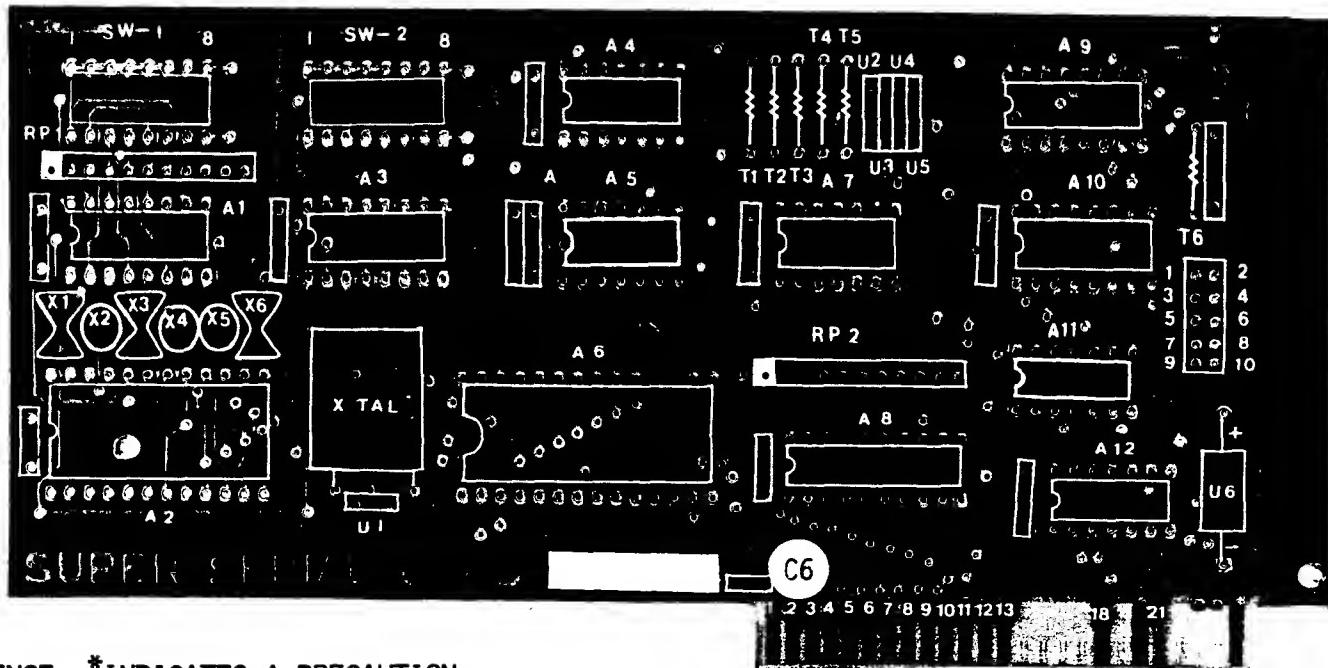
9	20
---	----

10	8
----	---



GUIDE 6-5

SUPER SERIAL CARD: Serial interface between computer and various devices including printer, terminal, plotter, modem. With power off, install in any slot except 0 (slot #2 recommended). Requires firmware (one EPROM).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

2 - 120 Ω @ T5,6

1 - 1 K Ω @ T1

3 - 12 K Ω @ T2,3,4

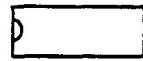
2 - 1 K Ω 11-pin SIP* bussed @ RP1,2

*Match pin 1 of SIPs with pin 1
(square) on the layout

SOCKETS *Match pin 1 of sockets with pin
1 on the layout. Check that ALL pins
have passed thru ALL holes

5 - 14-pin

3 - 16-pin



1 - 20-pin

1 - 24-pin

1 - 28-pin

CAPACITORS C Delete capacitor @ C6

1 - 22 pF @ U1

4 - 0.0033 μ F @ U2,3,4,5

11 - 0.1 Monolithic @

1 - 10 μ F/25V Axial* @ U6

*Match + of Axial
with + on the layout

CRYSTAL Y *Fold crystal flat against the
card before soldering. Ground
crystal to card

1 - 1.8432 MHz @ X TAL

SWITCHES

3 - 8-position DIP @ SW-1, SW-2, A9

*Switch @ A9 reconfigures header @ T6
for terminal or modem use

CONNECTOR

1 - 2x5 header, male, 90°, @ T6

INTEGRATED CIRCUITS *Match pin 1 of ICs with
pin 1 on the layout

1 - 74LS11 @ A12

1 - 74LS32 @ A11

1 - 74LS37 @ A7

1 - 74LS245 @ A8

1 - 74LS279 @ A10

2 - 74LS365 @ A1,3

1 - MC1488 @ A5

1 - MC1489 @ A4

1 - 6551A MPU @ A6

1 - 2716 EPROM @ A2

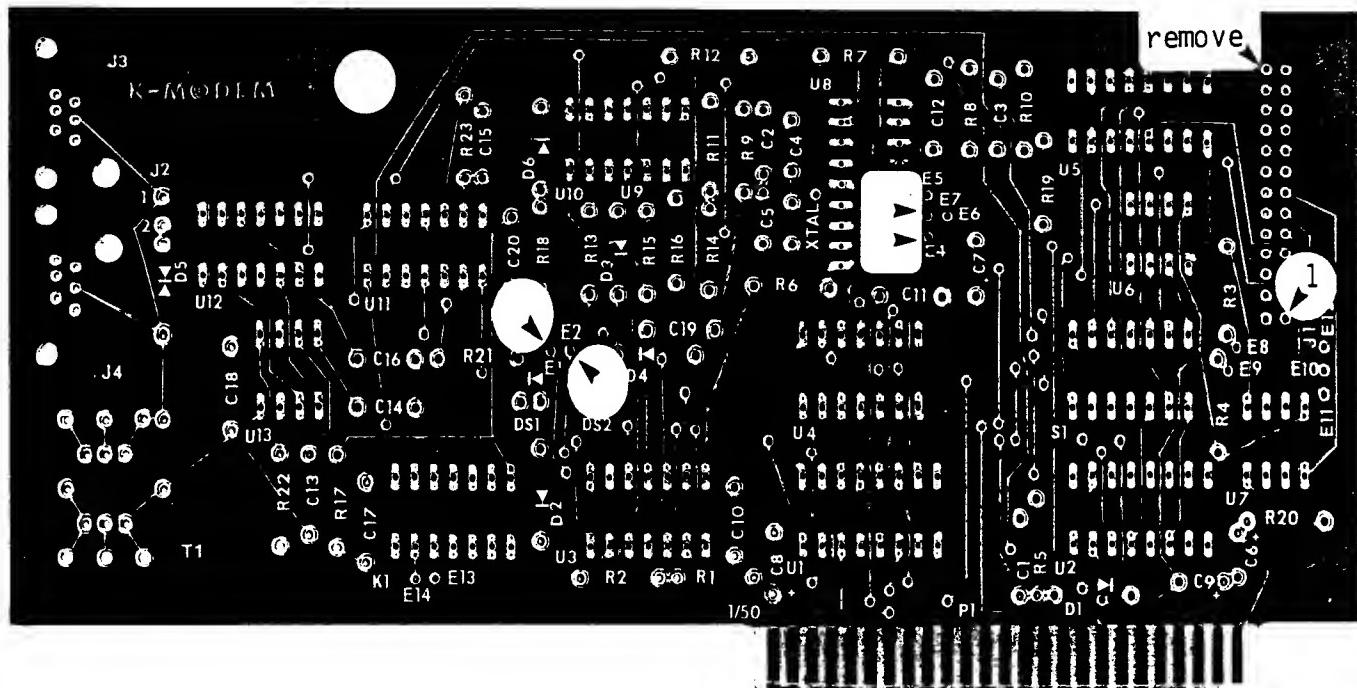
RIBBON CABLE with appropriate connectors
pinout for T6 as follows:

CARD	BD25	CARD	DB25
1	1	6	6
2	2	7	19
3	3	8	7
4	4	9	20
5	5	10	8



GUIDE 7-1

K-MODEM300: Direct connection to telephone line; allows for auto dialing and ring-detect for auto answering. Has built-in RS232 I/O for flexibility of application. With power off, install in any slot except 1 or 6. Requires software (one disk). User manual available from supplier.



SUGGESTED ORDER OF INSTALLATION

*INDICATES A PRECAUTION

DIODES D (Delete D5)

*Position banded end (cathode) of diodes as shown



- ____ 1 - 1N914 @ D1
____ 2 - 1N4004 @ D2,6
____ 2 - 1N751A 5.1 Zener @ D3,4
____ 2 - RLC210 (Dialco) LED* @ DS1,2
*Match the "DOT" (cathode) on the
LEDs with the cathode end on the
layout

RESISTORS R $\frac{1}{2}$ watt. 5%

- RESISTORS R-4 WIRE, $\frac{1}{2}$ watt, $\pm\%$
 _____ 1 - 560 Ω @ R16
 _____ 2 - 1 K Ω @ R10,18
 _____ 3 - 4.7 K Ω @ R17,19,20
 _____ 12 - 10 K Ω @ R1,2,3,4,5,6,7,8,12,
 R14,15,21
 _____ 1 - 6.8 K Ω @ R11
 _____ 1 - 47 K Ω @ R23
 _____ 1 - 100 K Ω @ R13
 _____ 2 - 10 M Ω @ R9.22

SOCKETS *Match pin 1 of sockets with
pin 1 (Ux) on the layout. Check
that ALL pins have passed thru
All holes before soldering.

SOCKETS (continued)

- 3 - 8-pin
 6 - 14-pin
 3 - 16-pin
 1 - 18-pin

CAPACITORS

SWITCH

- 1 - 76SC04 (Grayhill) @ S1
*all closed (towards the top)

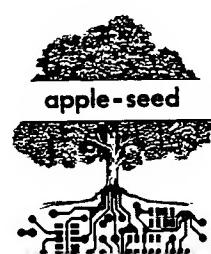
TRANSFORMER

- 1 - 141H (Hammond) 600CT/600CT
Line matching @ T1

CRYSTAL Y

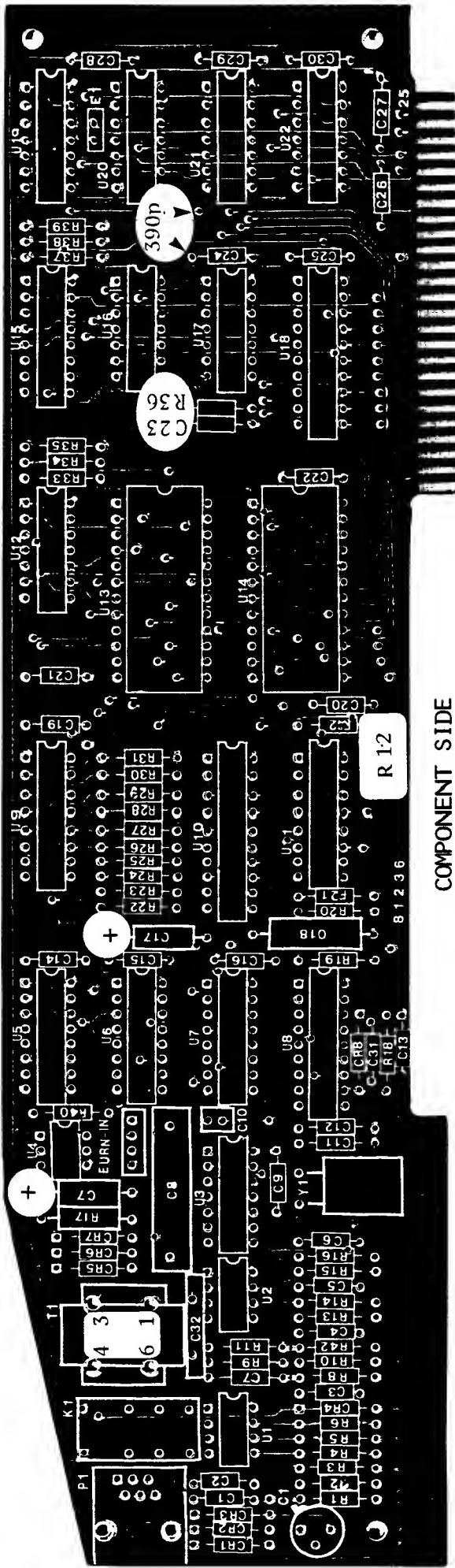
- 1 - 4.032 MHz @ XTAL
(continued)

(continued)



GUIDE 7-2

MODEMCARD: Direct connect to telephone line featuring 110 & 300 baud, half or full duplex, auto-answer/auto-dial. touch tone or pulse dialing. With power off, install in slot 2. Requires firmware (one EPROM).



SEQUENCE

*INDICATE A PRECAUTION
DIODES D *Position banded end of diode RESISTORS (continued)

2 - 1N4735A 6.2 V Zener @ CR1,2	9 - 10 kΩ @ R3,5,21,33,34,35,37	1 - 6-pin
2 - 1N4148 Switching @ CR3,5	1 - 3 MΩ @ R4	2 - 8-pin
1 - 1N750A 4.7 V Zener @ CR4	1 - 13 kΩ @ R6	8 - 14-pin
1 - 1N5231B 5.1 V Zener @ CR8	1 - 2 kΩ @ R13	6 - 16-pin
2 - 1N5254B 27 V Zener @ CR6,7	1 - 560 Ω @ R18	1 - 18-pin
RESISTORS R $\frac{1}{4}$ watt, 1% Precision	1 - 4.3 MΩ @ R19	2 - 20-pin
1 - 150 kΩ @ R1	1 - 4.7 kΩ @ R20	2 - 24-pin
4 - 10.0 kΩ @ R2,7,8,15	1 - 1 MΩ @ R22	CAPACITORS C *Match + of capacitors with
1 - 348 Ω @ R9	10 - 27 kΩ @ R23,24,25,26,27,28	+ on the layout
1 - 20.0 kΩ @ R42	1 - 470 Ω @ R36* Note position	23 - 0.1 μF Monolithic @ C1,2,3,4,5, C6,9,13,14,15,16,19,20,21,22
1 - 4.99 kΩ @ R14	1 - 15 kΩ @ R40	C24,25,26,27,28,29,30,31
1 - 7.68 kΩ @ R16		2 - 3.3 μF/16v Tantalum* @ C7,17
$\frac{1}{2}$ watt, 5%		1 - 0.47 μF/250v Polyester @ C8
1 - 5.6 kΩ @ R17		1 - 390 pF disc ceramic @ C10

INSTALL TALLEST COMPONENTS LAST

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

pin 1 upper right (square pad)

pin 1 lower right (square pad)

for ALL sockets

1 - 6-pin

2 - 8-pin

8 - 14-pin

6 - 16-pin

1 - 18-pin

2 - 20-pin

2 - 24-pin

23 - 0.1 μF Monolithic @ C1,2,3,4,5,
C6,9,13,14,15,16,19,20,21,22

C24,25,26,27,28,29,30,31

2 - 3.3 μF/16v Tantalum* @ C7,17

1 - 0.47 μF/250v Polyester @ C8

1 - 390 pF disc ceramic @ C10



C



E

pg 1 of 2

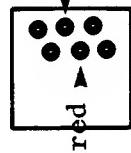
MODEMCARD (continued)

CAPACITORS (continued)

- 2 - 20 pF disc ceramic @ C11, 12
- 1 - 0.047 μ F/250V Mylar @ C18
- 1 - 330 pF disc ceramic @ C23
- 1 - 0.01 μ F/1 KV disc ceramic @ C32
- 1 - 390 pF disc ceramic between U17 & U21 as shown on the layout

CRYSTAL Y *Position body of crystal flat against the card before soldering

CONNECTORS
 — 1 - 4-pin header, straight @ BURN IN
 — 1 - 2-pin header, straight @ E1
 — 1 - modular telephone jack, 6-pin PCB mount @ P1 *Connect 1 leads as shown



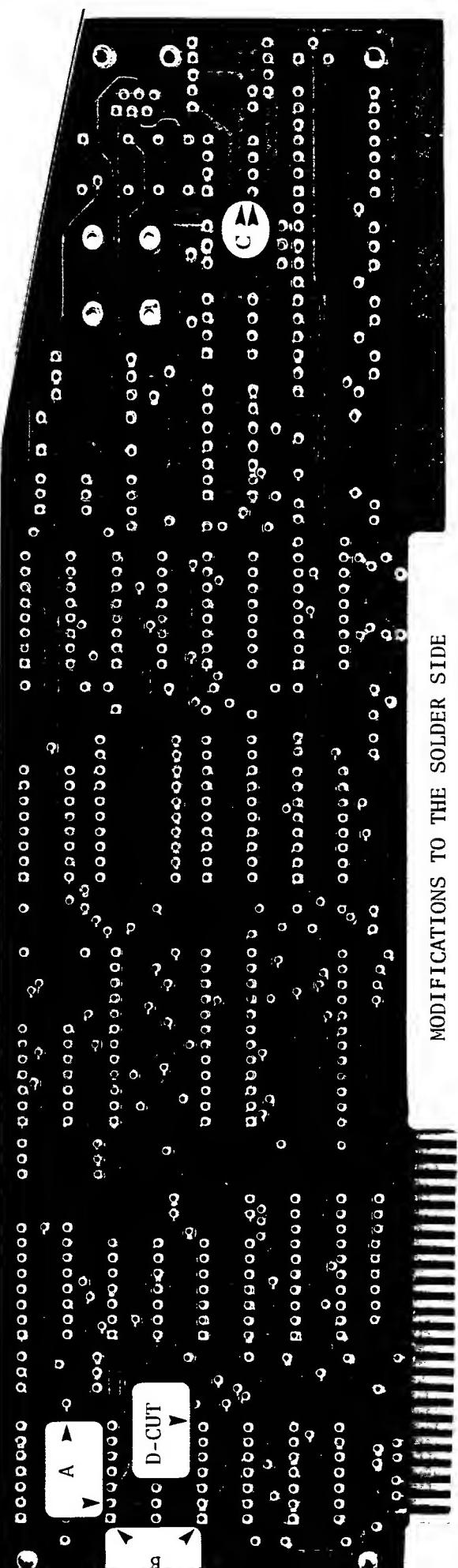
RELAY
 — 1 - RKT-12 (TAICO) or 275-213 (Radio Shack)
 — 12 V DC DPDT DIP relay

TRANSFORMER
 — 1 - 107H (Hammond) 1:1 600 Ω impedance line-matching
 — remove pins 2 & 5; use ONLY pins 1, 3, 4, 6
 INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 2 - 1458P @ U1, 2
- 1 - CD4011 @ U3
- 1 - 4N35 @ U4
- 2 - 14526B @ U5, 6
- 1 - CD4538 @ U7
- 1 - TMS99532 Modem (T.I.) @ U8
- 1 - 5089 (T.I.) @ U9
- 1 - 74LS273 @ U10
- 1 - 74LS174 @ U11
- 1 - 74LS125 @ U12
- 1 - 6850 @ U13
- 1 - 2716 @ U14 EPROM
- 1 - 74LS155 @ U15
- 1 - 74LS132 @ U16
- 1 - 74LS30 @ U17

MODIFICATIONS TO THE SOLDER SIDE Refer to layout below:
 CONNECT jumper wires on the SOLDER SIDE as shown @ A, B, C

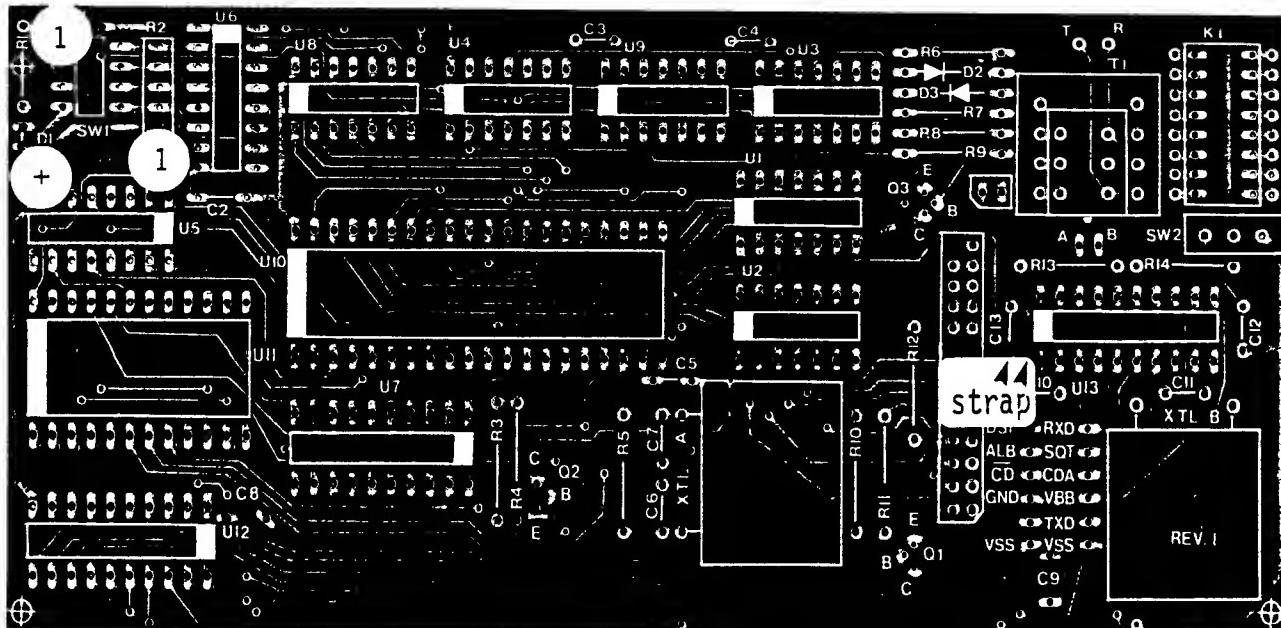
- 1 - U20 pin 2 to U19 pin 8 @ A-A
- 1 - U21 pin 1 to U20 pin 1 @ B-B
- 1 - U1 pin 8 to thick track leading to +12 V (pin 50) @C
 CUT track leading from pin 3, U21 on the SOLDER SIDE @ D



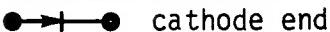
MODIFICATIONS TO THE SOLDER SIDE

GUIDE 7-3

RS232/MODEM: Offers serial I/O for external printer, terminal, or modem (300 BAUD). (1,200 BAUD available in future). Direct connect to telephone line featuring half/full duplex, auto-answer/auto-dial. With power off, install in any slot except 0 (slot 2 recommended). Requires firmware (one EPROM). Items labelled + are associated with the modem and may be omitted for serial use.



SUGGESTED SEQUENCE *INDICATES A PRECAUTION

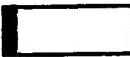
DIODES D *Position banded end (cathode) of diode as shown


— 2 - 1N914 @ D2,3
 — 1 - LED (red) @ D1 * Position longer lead (+) of LED as shown on the layout

RESISTORS R $\frac{1}{4}$ watt, 5%

— 1 - 330 Ω @ R1
 — 2 - 180 Ω @ R3,4
 + 1 - 600 Ω @ R14
 + 1 - 3.5 K Ω @ R13
 — 7 - 4.7 K Ω @ R6,7,8,9,10,11,12
 — 1 - 1 M Ω @ R5
 — 1 - 1 K Ω 5-pin SIP @ R2 *Position pin 1 (common) of SIP as shown on the layout

SOCKETS *Match pin 1 of sockets with pin 1 (square pad) on the layout. Check that ALL pins have passed thru ALL holes

- 7 - 14-pin
 - 1 - 16-pin
 - 3 - 20-pin
 - 1 - 24-pin
 - 1 - 40-pin
- 
 pin 1 (square pad)

SOCKETS (continued) * Note: The extra 16-pin pad @ K1 is available for future expansion

CAPACITORS C

— 2 - 27 pF @ C6,7
 — 7 - 0.1 μ F Monolithic @ C1,2,3,4,5,8,9
 + 3 - 0.1 μ F Monolithic @ C11,12,13
 + 1 - 1.5 μ F/10V Tantalum* @ C10
 *Match + of capacitor C10 with + as shown

TRANSISTORS Q *Position the EBC leads as shown on the layout

— 1 - 2N2904 @ Q1
 — 1 - 2N2906 @ Q2
 — 1 - 2N3906 @ Q3

CONNECTOR

— 1 - 2x13 male header strip, straight
 *Remove upper left pin of header
 *Pin 1 is indicated by a cut corner on the layout

SWITCHES

— 1 - 4-position DIP @ SW1* NB pin 1 on layout
 + 1 - SP/DT @ SW2 Answer/Originate
 *Position switch so that the toggle extends beyond the card

RS232/MODEM (Continued)

TRANSFORMER T

- + 1 - 630D (Hammond) or substitute pulse transformer, 1:1 turns ratio to fit the board. *NOTE: Use pads A & B for:
 1-other external transformer
 2-future 1,200 BAUD IC modification

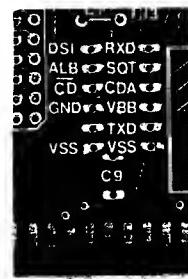
MODIFICATION ON THE COMPONENT SIDE

- 1 - Connect a jumper wire between C13 and the track from R13 as shown on the COMPONENT SIDE on the layout

CRYSTALS Y *Position body of crystal against card.*Insulate card from crystal with
+ 1 - 1.8432 MHz @ XTL A tape
+ 1 - 3.5795 MHz @ XTL B

RE MODEM CHIP

Refer to the National Semiconductor MM74HC942 300 Baud Modem Data Sheet for characteristics, applications, schematics and connection diagrams.



TELEPHONE CABLE

- + 1 - telephone cable of appropriate length terminating in a modular telephone plug
*Connect cable leads to T (Tip) and R (Ring)

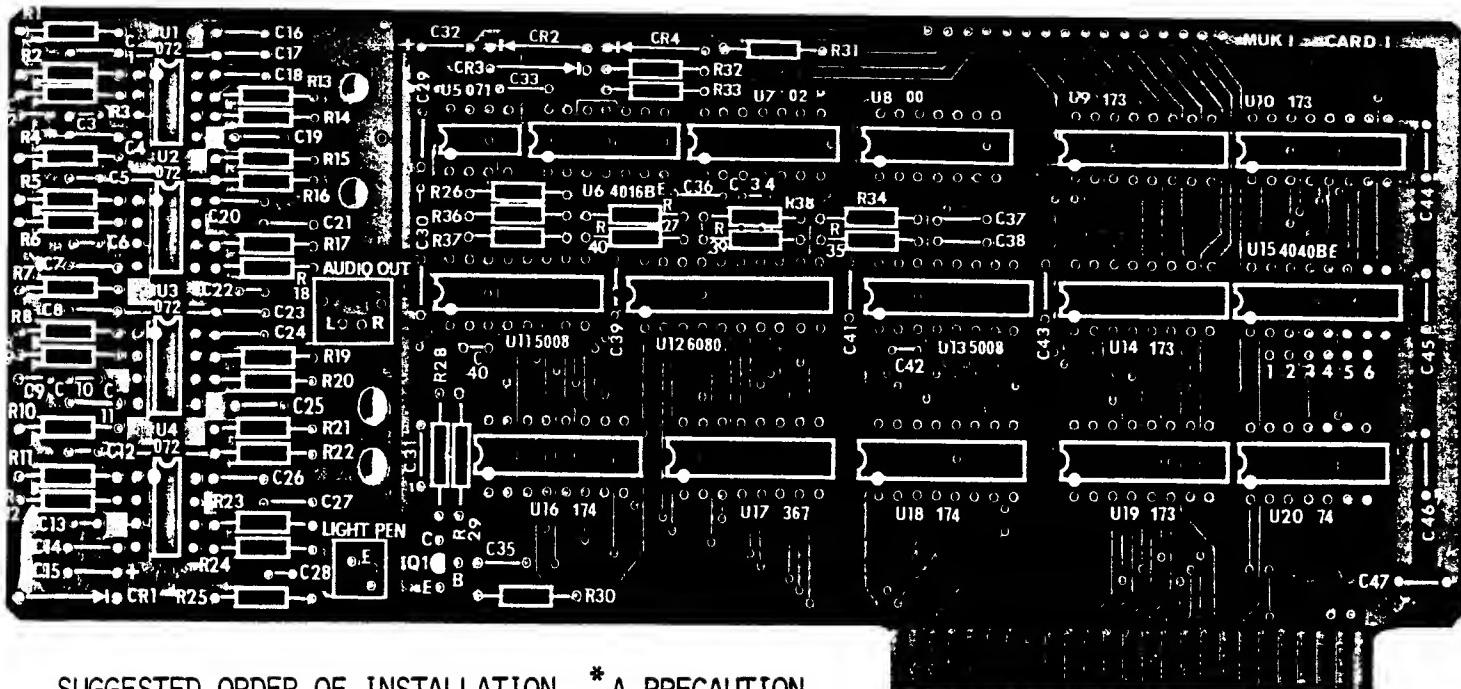
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS04 @ U4
1 - 74LS08 @ U3
1 - 74LS10 @ U8
1 - 74LS74 @ U9
1 - 74LS175 @ U5 pin 1
2 - 74LS245 @ U7,12
1 - 74LS367 @ U6
1 - 1488 @ U1
1 - 1489 @ U2
1 - 8250 @ U10
1 - 2716 EPROM @ U11
+ 1 - 74HC942 Modem IC (NAT) @ U13

GUIDES 8-1 & 8-2

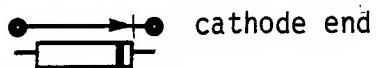
MUSIC SYSTEM: Consists of an analog card (CARD 1) interfaced with a digital card (CARD 2). Allows user to compose music, save it on disk and print copies of musical scores. With power off, install the connected cards in any two consecutive slots (except \emptyset) with CARD 1 in the LOWER numbered slot. Requires software (two disks) and documentation.

MUSIC CARD 1



SUGGESTED ORDER OF INSTALLATION * A PRECAUTION

DIODES D *position banded end (cathode) of diode toward the arrow as shown



- 2 - 1N757A 9.1 V Zener @ CR1,4
- 2 - 1N4148 @ CR2,3

RESISTORS R $\frac{1}{4}$ watt, 5%

- 2 - 100 Ω @ R25,31
- 1 - 220 Ω @ R39
- 2 - 240 Ω @ R13,19
- 4 - 470 Ω @ R26,36,37,38
- 2 - 1 K Ω @ R33,40
- 1 - 3 K Ω @ R34
- 3 - 4.7 K Ω @ R27,28,35
- 1 - 6.2 K Ω @ R32
- 2 - 6.8 K Ω @ R15,21
- 2 - 12 K Ω @ R1,7
- 2 - 18 K Ω @ R4,10
- 2 - 33 K Ω @ R3,9
- 2 - 36 K Ω @ R2,8
- 4 - 51 K Ω @ R6,12,16,22
- 2 - 56 K Ω @ R14,20
- 4 - 100 K Ω @ R5,11,29,30
- 2 - Jumper @ R17,23
- 2 - Blank @ R18,24

SOCKETS *Match pin 1 of sockets with pin 1 (white dot) on the layout. Check that ALL pins have passed thru ALL holes

5 - 8-pin

4 - 14-pin

10 - 16-pin

1 - 20-pin



pin 1

CAPACITORS C

- 1 - 27 pF Mica @ C40
- 2 - 47 pF Mica @ C6,13
- 1 - 100 pF Mica @ C42
- 4 - 220 pF Mica @ C3,10,22,28
- 4 - 0.001 μ F @ C2,5,9,12
- 1 - 0.01 μ F @ C34
- 32 - 0.1 μ F Monolithic @ C1,4,7,8,11,14, C16,17,18,19,20,21,23,24, C25,26,27,29,30,31,33,35, C36,37,38,39,41,43,44,45, C46,47
- 2 - 10 μ F/25v Tantalum* @ C15,32

*Match + of capacitor with + on layout

CONNECTOR

- 1 - 1x16 female header, 8 mm deep
- *To interface with 1x16 male header of CARD 2

MUSIC SYSTEM I (continued)

TRANSISTOR Q *Install the three EBC transistor leads correctly

1 - 2N2222A @ Q1

INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 on the layout

1 - 74LS00 @ U8

1 - 74LS02 @ U7

1 - 74LS74 @ U20

4 - 74LS173 @ U9,10,14,19

2 - 74LS174 @ U16,18

1 - 74LS367 @ U17

4 - TL072 @ U1,2,3,4

1 - TL071 @ U5

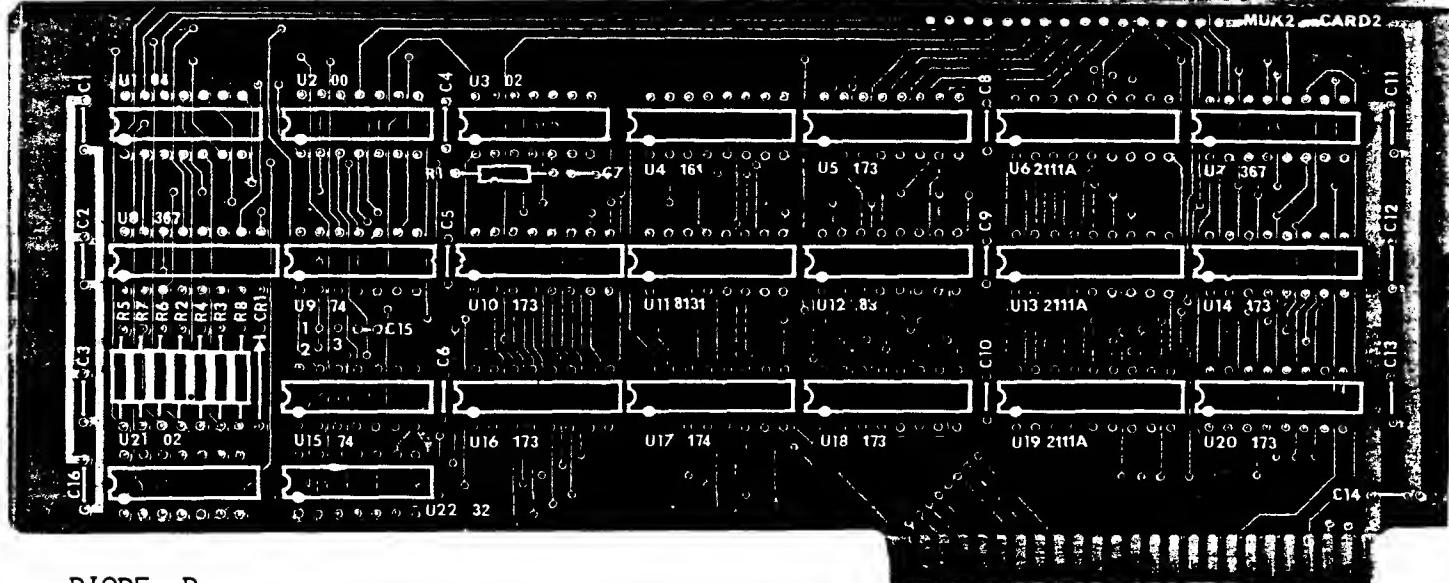
1 - CD4016BE @ U6

1 - CD4040BE @ U15

2 - NE5008 @ U11,13

1 - AM6080 (AMD) @ U12

MUSIC CARD 2



DIODE D

1 - 1N4148 @ CR1

RESISTORS R $\frac{1}{4}$ watt 5%

4 - 1 K Ω @ R1,2,5,8

2 - 1.2 K Ω @ R4,7

2 - 4.7 K Ω @ R3,6

SOCKETS

7 - 14-pin

12 - 16-pin

3 - 18-pin

CAPACITORS C

1 - 100 pF Mica @ C7

AUDIO OUTPUT CABLE

Shielded cable of appropriate length terminating in RCA dual phono plugs. For stereo, connect stripped end to jumper pins as shown

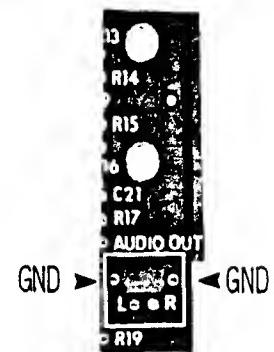
L = Left channel

R = Right channel

GND = Ground

Secure cable with an insulated tie thru the two large holes

LIGHT PEN IMPROVISE!!



connect tie strain relief to E
two insulated wires connected to MRD370 phototransistor with pin B removed
connect to C drill hole pen with cartridge removed

INTEGRATED CIRCUITS

1 - 74LS00 @ U2

2 - 74LS02 @ U3,21

1 - 74LS04 @ U1

1 - 74LS32 @ U22

2 - 74LS74 @ U9,15

1 - 74LS83 @ U12

1 - 74LS161 @ U4

6 - 74LS173 @ U5,10,14,16,18,20

1 - 74LS174 @ U17

2 - 74LS367 @ U7,8

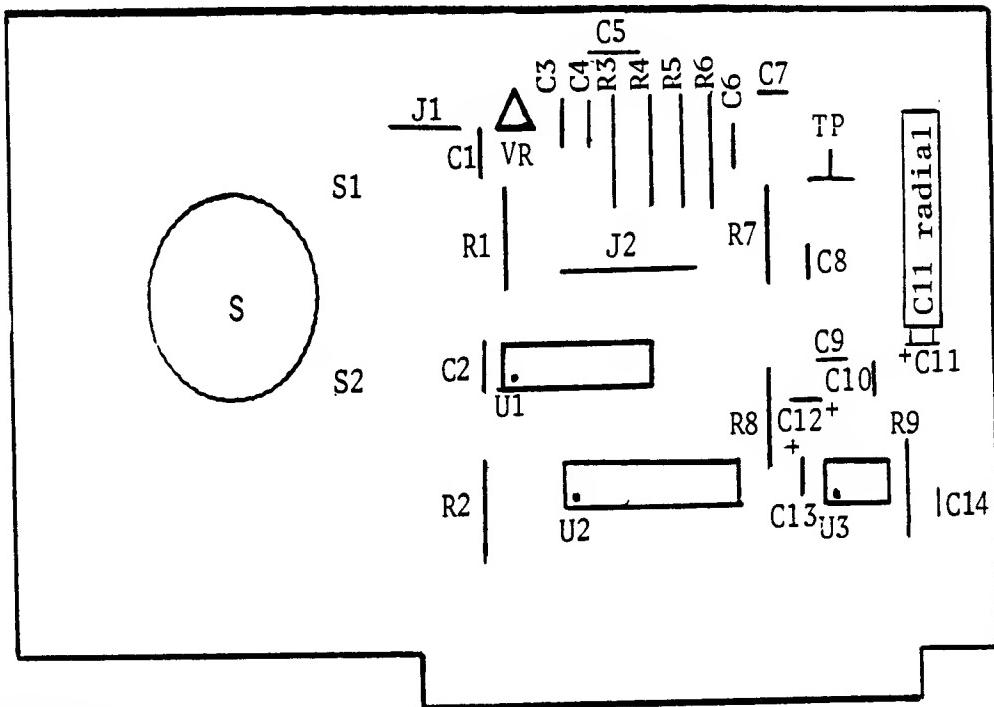
1 - DM8131 (NAT) @ U11

GUIDE 8-3

VOICE MACHINE: Versatile, high-quality speech synthesizer created entirely in software. Uses the phonetic alphabet. Type the word and produce the sound. With power off, install in slot number 5. Requires software (one disk).

**COMPONENT SIDE
OF CARD**

Single-layer, single-sided peripheral circuit card.
Install components on the **COMPONENT SIDE** and solder to the **SOLDER SIDE**



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 11 Ω @ R9
- 1 - 560 Ω @ R3
- 2 - 2 K Ω @ R2,4
- 1 - 3.3 K Ω @ R1
- 3 - 10 K Ω @ R5,7,8
- 1 - 220 K Ω @ R6
- 1 - 5 K Ω trimpot, @ TP

SOCKETS *Match pin 1 of sockets with pin 1 (dot) on the layout. Check that ALL pins have passed thru ALL holes

- 1 - 8-pin
- 1 - 16-pin
- 1 - 20-pin

CAPACITORS C

- 1 - 0.005 μ F @ C7
 - 3 - 0.02 μ F @ C5,6,9
 - 7 - 0.1 μ F Monolithic @ C1,2,3,4
C8,10,14
 - 1 - 470 μ F/16v radial* @ C11
 - 1 - 10 μ F/16v radial* @ C12
 - 1 - 1 μ F/16v radial* @ C13
- *Match + of radial capacitors with + on the layout

JUMPER

- 2 - @ J1,2

VOLTAGE REGULATOR

- 1 - 7805 +5V @ VR

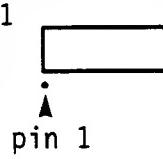
*Position "flat" part of device towards the top of the card

SPEAKER S

- 1 - small, 8 Ω @ S
- Secure speaker in S opening and solder the two leads to S1 and S2

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 (dot) on the layout

- 1 - MC1408PB @ U1
- 1 - 74LS273 @ U2
- 1 - LM386 @ U3



pin 1



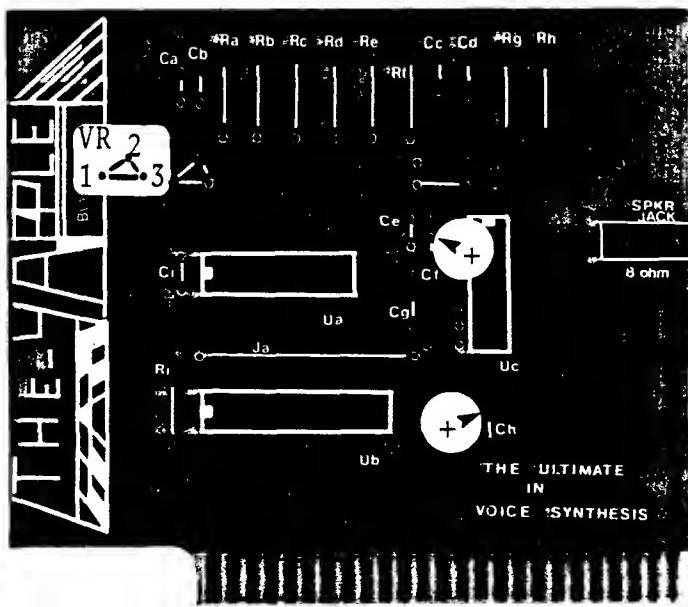
apple-seed

GUIDE 8-4

THE YAPPLE CARD: By typing the word using the phonetic alphabet, this speech synthesizer allows the user to blend sounds together into most English utterances. With power off, install in slot number 4. Requires software (one disk). User manual available from supplier.

COMPONENT SIDE

Single-layer, single-sided circuit card
 *Install components on the component side & solder to solder side



SUGGESTED SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{2}$ watt, 5%

- ____ 2 - 5.6 K Ω @ Ra,d
- ____ 1 - 560 Ω @ Rb
- ____ 2 - 2.2 K Ω @ Rc,i
- ____ 1 - 220 Ω @ Re
- ____ 1 - 10 K Ω @ Rf
- ____ 2 - 1 K Ω @ Rg,j
- ____ 1 - 47 K Ω @ Rh

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- ____ 1 - 14-pin
- ____ 1 - 16-pin
- ____ 1 - 20-pin

CAPACITORS C

- ____ 5 - 0.1 μ F @ Ca,b,e,g,i
- ____ 2 - 0.047 μ F @ Cc,d
- ____ 1 - 10 μ F/16V radial* @ Cf
- ____ 1 - 220 μ F/16V radial* @ Ch

*Match + of radial capacitors with + on the layout

VOLTAGE REGULATOR

____ 1 - 78L05 5V @ VR *Position the three leads as shown on layout

SPEAKER AND CONNECTORS

____ 2 - male header pins, straight @ SPKR JACK

____ 1 - 10-20 cm, 8-ohms speaker in vented box; connect speaker wires to jack

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

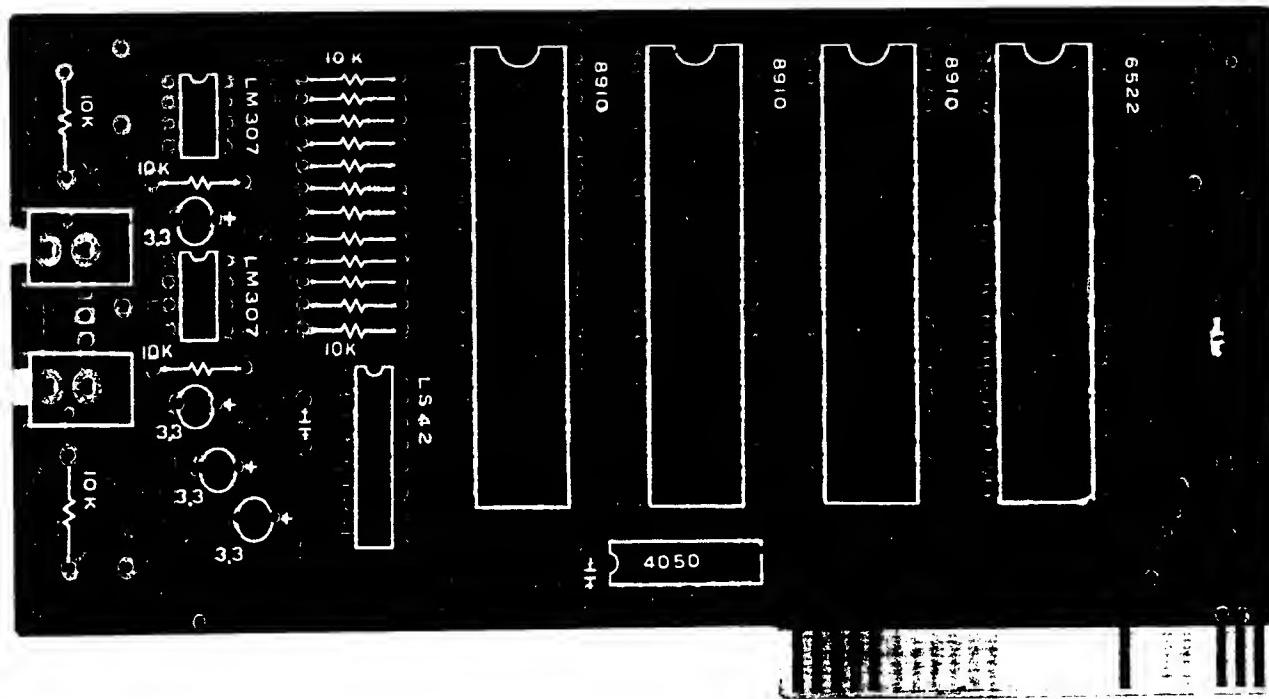
- ____ 1 - MC1408 @ Ua
- ____ 1 - 74LS273 @ Ub
- ____ 1 - LM380 @ Uc

pin 1



GUIDE 8-5

MUSIC MACHINE: A nine-voice card that allows user to enter, modify, play, and create music. With power off, install in slot number 5. Requires software, documentation, paddles, and home stereo system.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS $\frac{1}{4}$ watt, 5%
16 - 10 K Ω

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes
2 - 8-pin
2 - 16-pin
4 - 40-pin

CAPACITORS C
3 - 0.1 μ F Monolithic @ location:

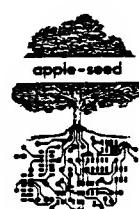
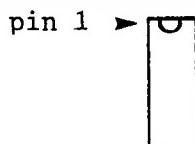
4 - 3.3 μ F/25v Tantalum* Match + of capacitor with + on the layout

JACKS
2 - audio jacks, PCB mount

CABLES
2 - audio cables to suit

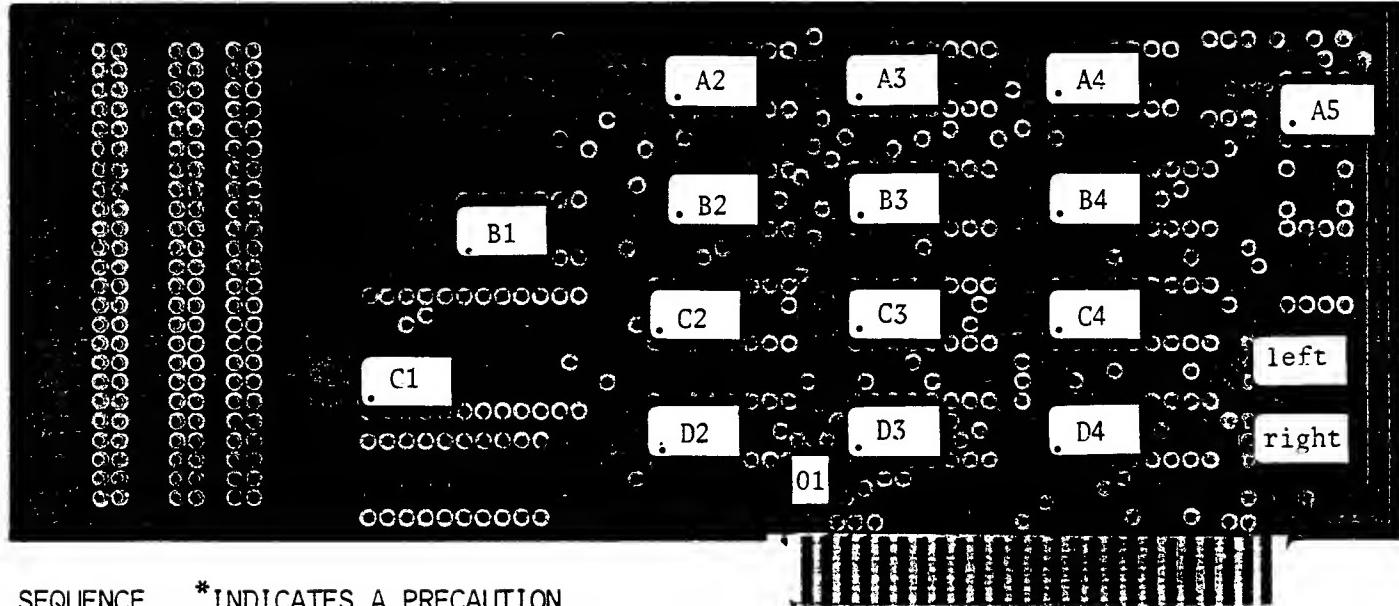
INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 on layout

<u>2</u> - LM307
<u>1</u> - 74LS42
<u>1</u> - CD4050
<u>1</u> - 6522 VIA
<u>3</u> - 8910 (General Instruments) programmable sound generator



GUIDE 8-6

THREE-VOICE SYNTHESIZER CARD: Computer-controlled music that plugs into a home stereo system. Each voice has control of pitch, envelope, & volume. Use one card for mono; two for stereo. With power off, install in any slot (number 4 recommended). Requires software & documentation.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{2}$ watt, 5%

- 2 - 470 Ω
- 2 - 1 K Ω
- 2 - 2 K Ω
- 14 10 K Ω

SOCKETS *Match pin 1 of sockets with pin 1 (dot) on the layout. Check that ALL pins have passed thru ALL holes

- 1 - 8-pin
- 4 - 14-pin
- 6 - 16-pin
- 3 - 18-pin
- 1 - 24-pin

pin 1 lower left for
ALL sockets
and ICs

CAPACITORS C

- 6 - 0.1 μ F Monolithic @ • 01 •
- 3 - 6.8 μ F/35V Tantalum*

@ • 68 •

*Match + of capacitors with + on the layout

CONNECTORS

- 2 - 1X3 male header strip, 90° @ left & right, for audio output

VOLTAGE REGULATOR

- 1 - 7805UC *Install three leads as shown

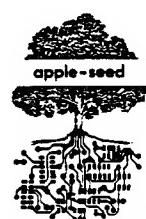
•
• 05 •

CRYSTAL Y

- 1 - 1.7800 MHz @ XTAL *Position the crystal flat against the card before soldering

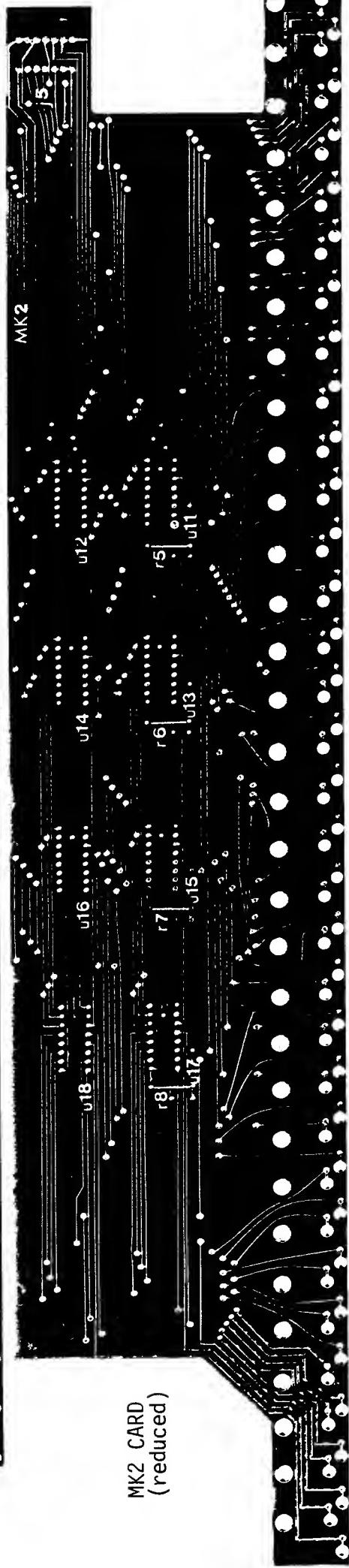
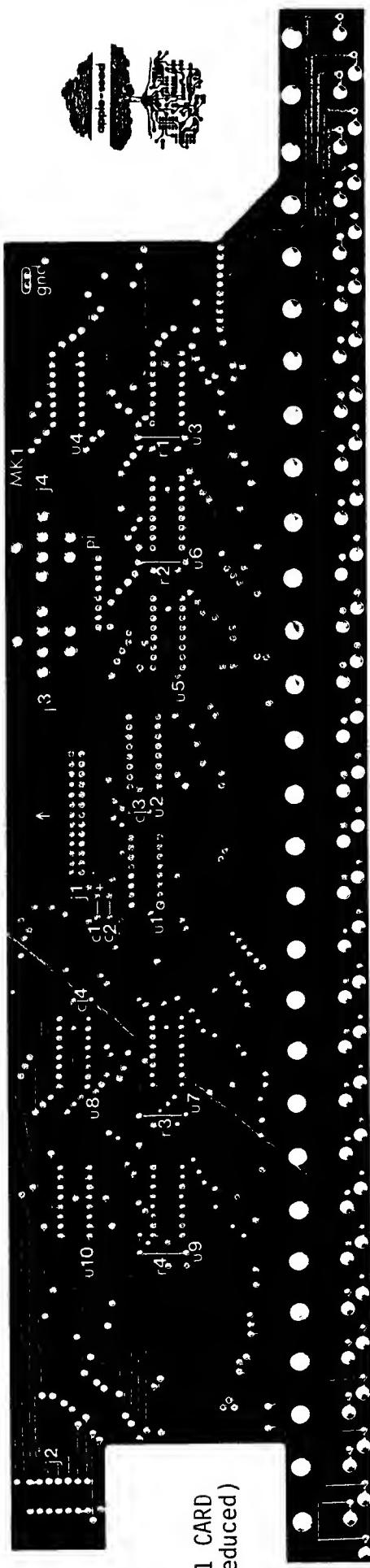
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 (dot) on the layout

- 1 - 74LS624 (74LS324) @ B1
- 1 - 8253 @ C1
- 1 - 74LS32 @ A2
- 1 - 74LS04 @ B2
- 2 - 74LS75 @ C2,D2
- 4 - CD4723B @ A3,B3,C3,D3
- - Access Socket (empty) @ A4
- 3 - 8227DP @ B4,C4,D4
- 1 - LM307 @ A5



GUIDES 8-7, 8-8 & 8-9

INSTRUMENT SYNTHESIZER: A digital music synthesizer consisting of two cards (MK1 & MK2) to interface with a 5-octave organ keyboard, & one interface card that connects the keyboard to the computer (slot 2). Allows music to be played directly or recorded and recalled later. Requires pair of Music Cards (GUIDES 8-1 & 2) in slots 4 & 5 and software (5 disks). Available as three bare cards or complete system only.

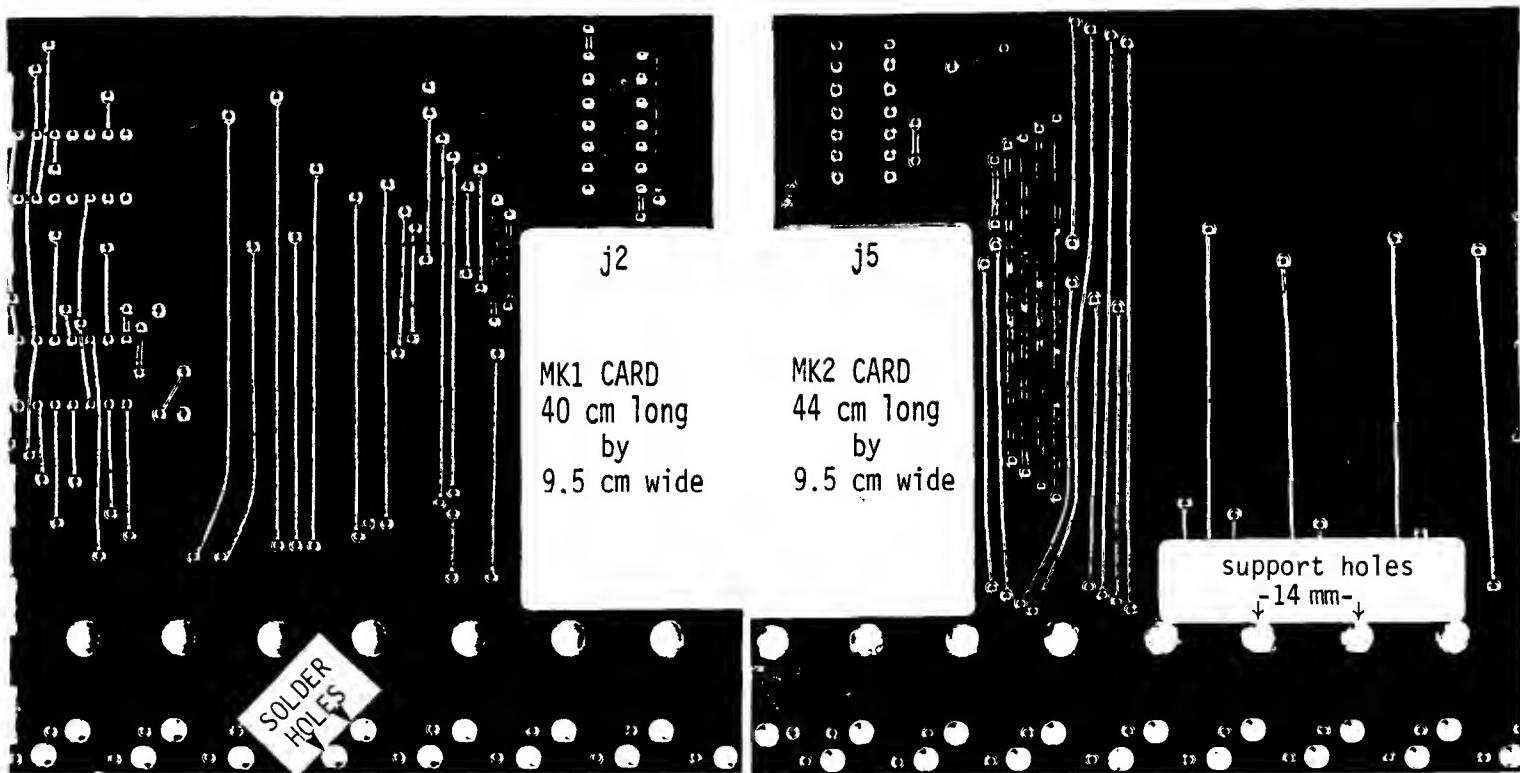


SUGGESTED ORDER OF INSTALLATION *INDICATES A PRECAUTION *THE FOLLOWING REFERS TO BOTH THE MK1 & MK2 CARDS

- RESISTORS R $\frac{1}{4}$ watt, 5%
— 8 - 3 kΩ @ r1,2,3,4,5,6,7,8
- CAPACITORS C
— 3 - 0.1 μF Monolithic @ c2,3,4
— 1 - 10 μF/16V Tantalum* @ c1*Match
- SOCKETS *Match pin 1 of sockets with
pin 1, lower left, on the layout.
Check that ALL pins have passed thru
ALL holes
- 18 - 16-pin
— 16 - 14-pin @ j2 & j5
- 12 - 2 - 14-pin @ j1
- CONNECTORS
— 2 - stereo jacks, PCB mount, @ j3,4,
for foot pedals (Roland, model
DP2, pedal switch)
- CIRCUITS *Match pin 1 of ICs
— 1 - 2x13 male header strip, right
angle @ J1
- WIRE
— 1 - 20 cm length of insulated
wire at gnd (refer to installation
instructions for hookup)

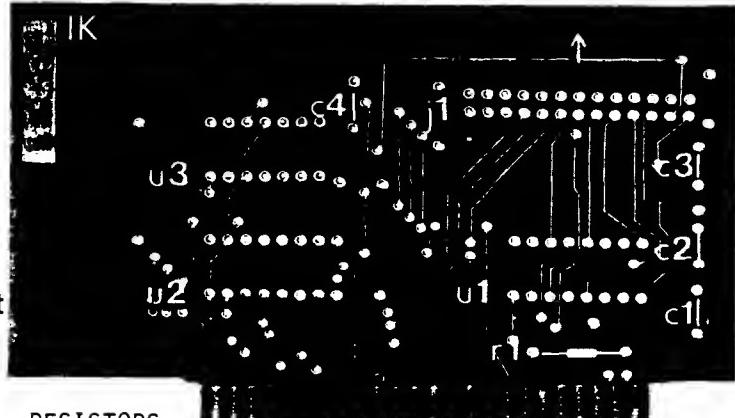
INSTRUMENT SYNTHESIZER (Continued) (8-7, 8-8, 8-9)

Solder Side of MK1 & MK2; Bottom View of Keyboard.
Close to Actual Size.



To FRONT of Keyboard

INSTRUMENT SYNTHESIZER COMPUTER INTERFACE CARD



RESISTORS

— 1 - 1 KΩ @ r1

SOCKETS *pin 1: white dot

— 1 - 14-pin

— 2 - 16-pin

CAPACITORS

— 3 - 0.1 µF Monolithic @ c2,3,4

— 1 - 10 µF/16V Tantalum* @ c1

*Match + of capacitor
with + on the layout

CONNECTOR

— 1 - 2x13 male header strip, 90° @ j1

INTEGRATED CIRCUITS

— 1 - 74LS00 @ u3

— 2 - 74LS367 @ u1,2

INSTALLATION of the MK1 @ MK2 cards to the two-bus, 61-key (5-octave) organ keyboard:
The "pegs" of the keyboard fit thru the support holes of each card. Slip the 64 "solder leads" of the keyboard thru the 64 solder holes of MK2 & solder in place. Butt MK2 to MK1 as shown and solder the 58 "solder leads" to the 58 solder holes of MK1.

CABLES

- 1 - 5-7 cm length of 14-conductor flat ribbon cable with DIP sockets to connect j2 of MK1 to j5 of MK2
- 1 - 6 m length of 26-conductor flat ribbon cable with two AMP header connectors to connect j1 of MK1 to j1 of computer interface card. *Match pin 1 (white dot) of j1 of MK1 to j1 (white dot) of interface card
- 1 - 20 cm length of insulated wire from ground (gnd) of MK1 soldered to the chassis of the organ keyboard & the TWO keyboard bus lines

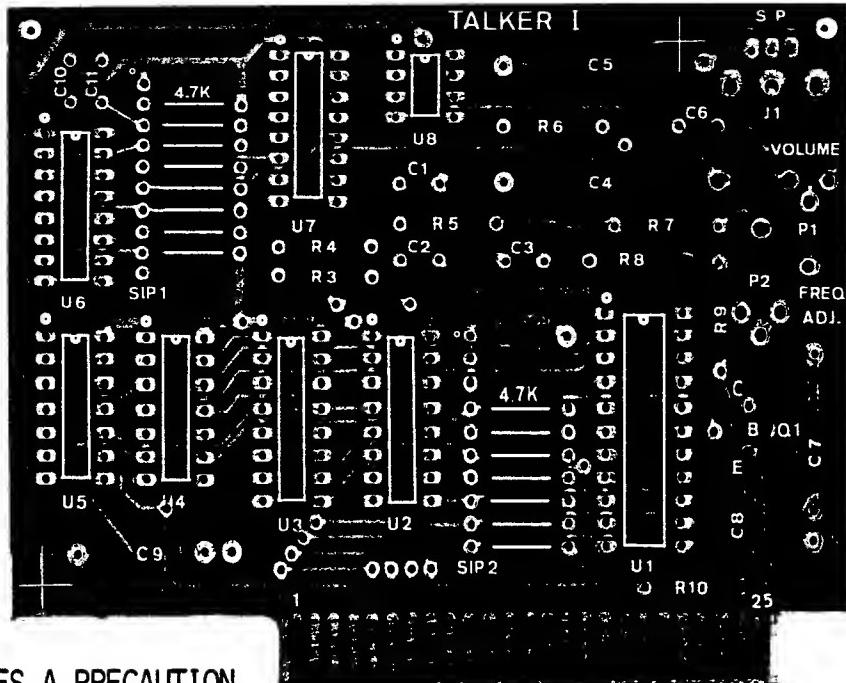
KEYBOARD: Pratt Read Co.
Model 10-0-1184-1-00
61-n c/c Keyboard
with switch



CASE: To suit

GUIDE 8-10

TALKER I: Electronic speech synthesizer using the Votrax chip. Employs phoneme synthesis to allow user to construct an unlimited vocabulary by "pronouncing" in sequence the individual phonemes (simple sounds of spoken language). With power off, install in any slot except \emptyset . Requires software (one disk).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 10 Ω @ R6
- 1 - 3.3 K Ω @ R5
- 2 - 4.7 K Ω @ R3,4
- 1 - 6.8 K Ω @ R8
- 1 - 10 K Ω @ R7
- 1 - 100 K Ω @ R10
- 2 - 10 K Ω Trimpot @ P1,2
- 2 - 4.7 K Ω 10-pin SIP* @ SIP 1,2
*Position pin 1 of SIPs at o
as shown on the layout
- 1 - R9 trim, if required. (2.7 K Ω to
3.9 K Ω coarse frequency adjustment)

SOCKETS *Match pin 1 of sockets with pin 1
on the layout. Check that ALL pins
have passed thru ALL holes

- 1 - 8-pin pin 1 →
- 2 - 14-pin upper left for
- 4 - 16-pin ALL sockets
- 1 - 22-pin and ICs

CONNECTORS

- 1 - 2-pin Molex header @ SP or J1

TRANSISTOR Q *Position EBC leads correctly
— 1 - 2N2222 @ Q1

CAPACITORS C

- 1 - 150 pF @ C8
 - 3 - 0.01 μ F @ C3,10,11
 - 3 - 0.1 μ F Monolithic @ C1,2,6
 - 2 - 10 μ F/16V Tantalum* @ C7,9
 - 2 - 220 μ F/16V Axial* @ C4,5
- *Match + of electrolytic
capacitors with + on layout

INTEGRATED CIRCUITS * Match pin 1 of ICs
with pin 1 (o) on layout

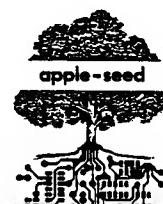
- 1 - SC-01A @ U1 Votrax
- 2 - 74LS75 @ U2,3
- 1 - 7416 @ U4
- 1 - 74LS02 @ U5
- 1 - 74LS123 @ U6
- 1 - 74LS367 @ U7
- 1 - LM 386 @ U8 audio amp (1 watt)

ADJUST:

- P1 pot for loudness (VOLUME)
- P2 pot for tone (FREQ. ADJ.)

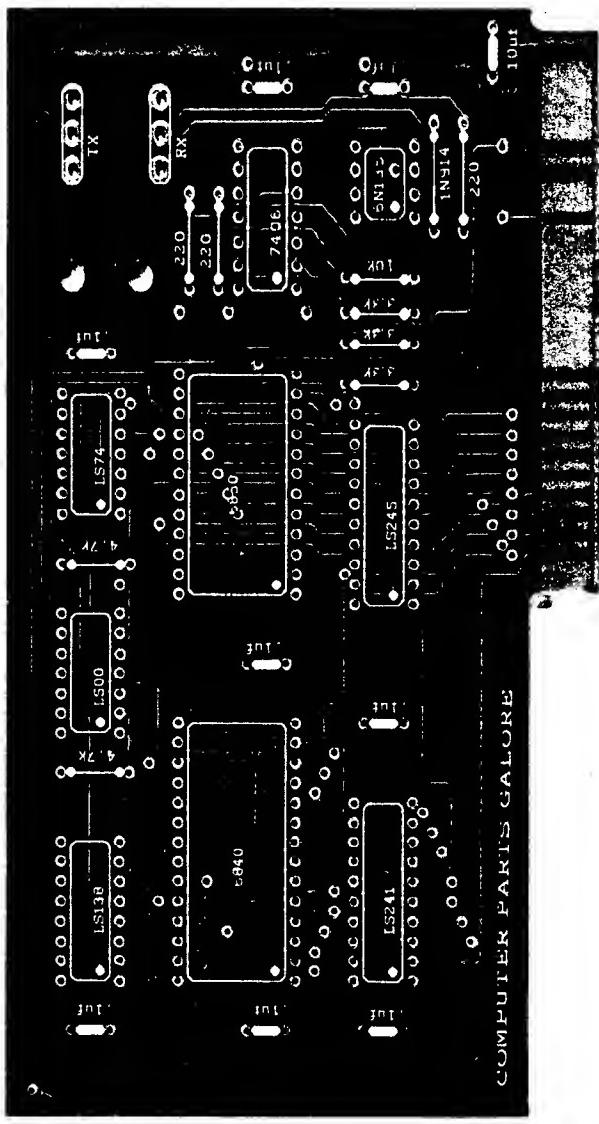
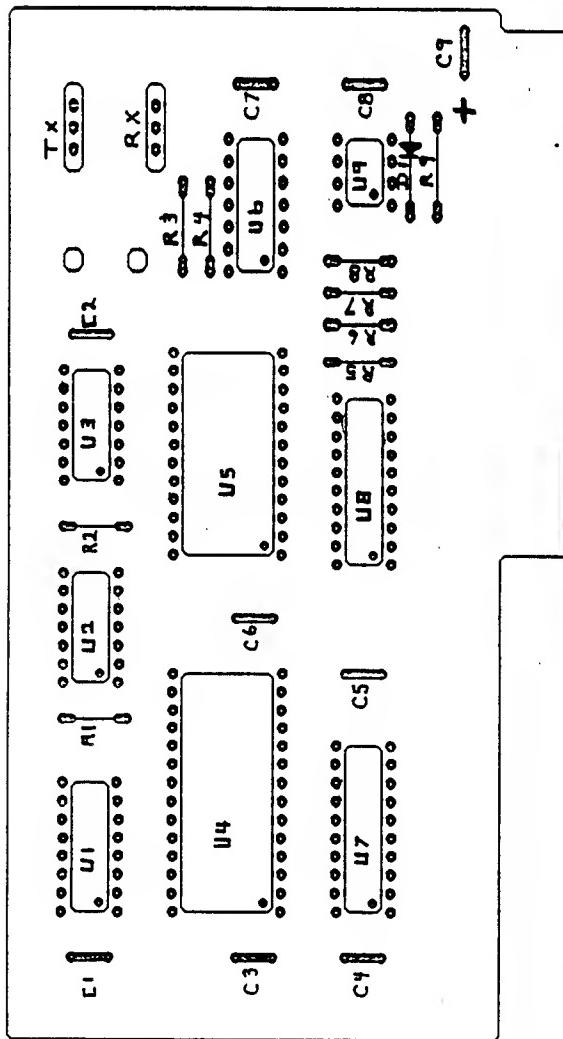
SPEAKER

- 1 - 8 Ohm



GUIDE 8-11

6850 MIDI CARD: Allows user to interface synthesizers, drum machines & other MIDI (Musical Instrument Device Interface) equipped musical instruments to the computer. Software required. Documentation available from supplier.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 3 - 220 Ω @ R3,4, — 1 22 Ω @ R9
- 3 - 3.3 K Ω @ R5,6,7
- 2 - 4.7 K Ω @ R1,2
- 1 - 10 K Ω @ R8

DIODES D *Position banded end of diode at arrow on the layout

- 1 - 1N914* @ D1

SOCKETS *Match pin 1 of sockets with pin 1 (white dot) on the layout. Check that ALL pins have passed thru ALL holes

- 1 - 8-pin
- 3 - 14-pin
- 1 - 16-pin
- 2 - 20-pin

CAPACITORS (continued)

- 1 - 10 μ F/16 V Tantalum* Match + of cap @ C9 with + on layout

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

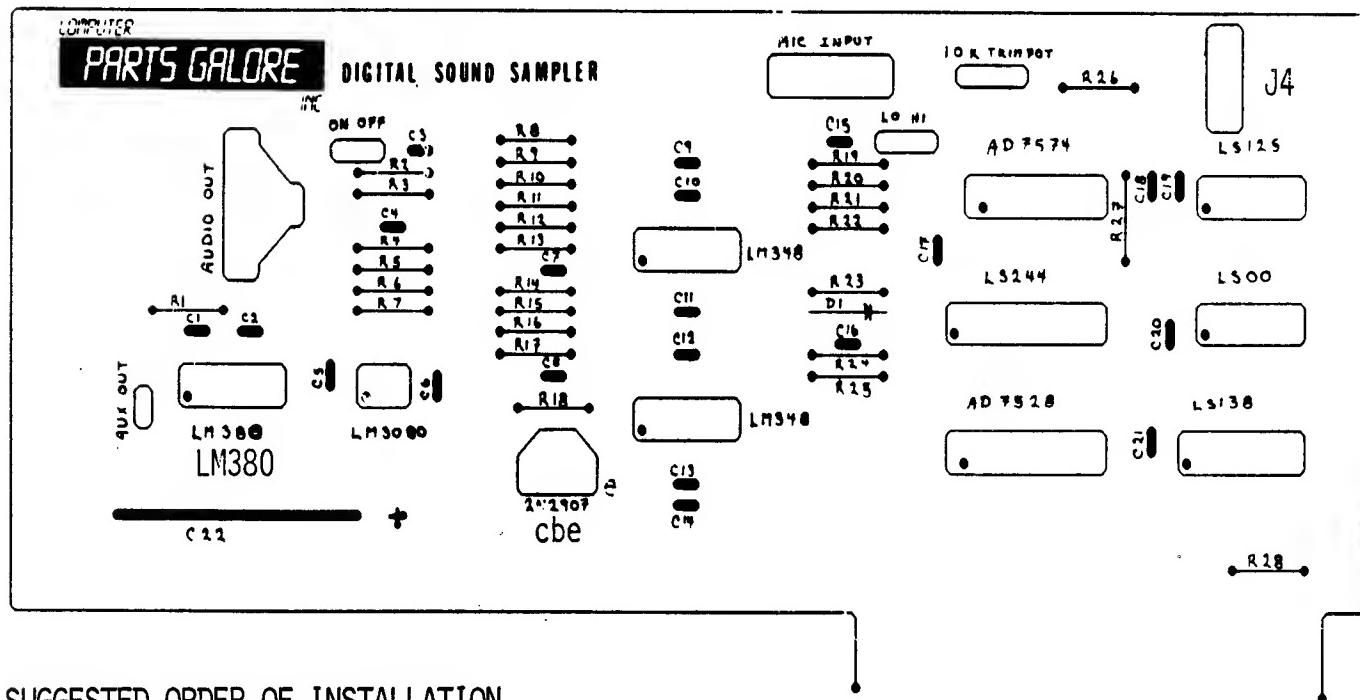
- 1 - 74LS00 @ U2
- 1 - 74LS74 @ U3
- 1 - 74LS138 @ U1
- 1 - 74LS241 @ U7
- 1 - 74LS245 @ U8
- 1 - 7406 @ U6
- 1 - 6N135 @ U9
- 1 - 6840 @ U4
- 1 - 6850 @ U5

CONNECTORS





PG DIGITAL SOUND SAMPLER: Allows user to digitally sample an audio input and to reproduce the sounds digitally thru externally connected speakers. With power off, install in any slot. Software available from supplier.



SUGGESTED ORDER OF INSTALLATION

*INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diode towards the arrow

1 - 1N914

RESISTORS R $\frac{1}{4}$ watt 5%

1 - 510 Ω @ R23

7 - 1 K Ω @ R1,2,3,5,6,26,28

1 - 5.1 K Ω @ R13

1 - 6.8 K Ω @ R18

6 - 10 K Ω @ R4,9,11,14,19,21

4 - 100 K Ω @ R7,10,15,20

1 - 180 K Ω @ R27

1 - 220 K Ω @ R8

2 - 330 K Ω @ R12,22

2 - 5.1 K Ω metal oxide @ R16,17

2 - 25.1 K Ω metal oxide @ R24,25

1 - 10 K Ω Trimpot @ 10 K TRIMPOT
controls input gain

SOCKETS *Match pin 1 of sockets with pin 1 (dot) on the layout. Check that ALL pins have passed thru ALL holes

1 - 8-pin

4 - 14-pin

1 - 16-pin

1 - 18-pin

2 - 20-pin

CAPACITORS C *C17 is not equipped

2 - 100 nF @ C4,18

CAPACITORS (continued)

4 - 0.47 F @ C7,9,14,15

— 1 - 470 F/50V Axial* @ C22

*Match + of axial with + on layout

TRANSISTOR Q *Match ebc leads of transistor with ebc on the layout

— 1 - 2N2907

CONNECTORS

— 1 - 2-pin male header @ AUX OUT
provides a duplicate signal of the RCA audio output

— 1 - 3-pin male header @ ON OFF
controls a simple hi frequency filter for the output

— 1 - 3-pin male header @ LO HI
selects input sensitivity

HI = 10 mV to 200 mV (P-P)

LO = 200 mV to 4 volts (P-P)

— 1 - 4-pin male header @ J4
to connect a feed back control pot for certain software. Not normally equipped

— 1 - 3.5 female PC mount jack for MIC INPUT

— 1 - RCA female PC mount jack for AUDIO OUT

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

— 1 - 74LS00

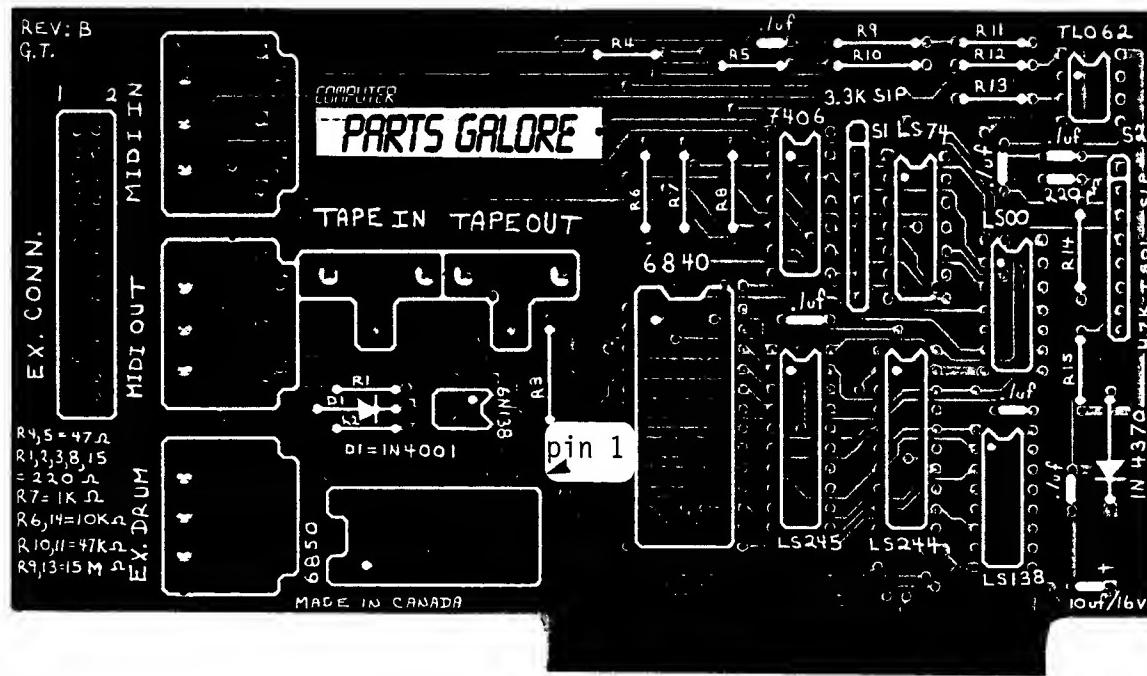
— 1 - 74LS125

— 1 - AD7574

— 2 - LM348

GUIDE 8-13

ADVANCED 6850 MIDI CARD (Ver 2): Allows user to interface synthesizers, drum machines & other MIDI (Musical Instrument Device Interface) equipped musical instruments to the computer. Requires software. Documentation available from supplier.



SEQUENCE *INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diode toward the arrow
 —— 1 - 1N4001 @ D1
 —— 1 - 1N4370 2.4 V Zener diode/500 mV @ 1N4370

RESISTORS R $\frac{1}{2}$ watt, 5%
 —— 2 - 47 Ω @ R4,5
 —— 5 - 220 Ω @ R1,2,3,8,15
 —— 1 - 470 Ω @ R12
 —— 1 - 1 KΩ @ R7
 —— 2 - 10 KΩ @ R6,14
 —— 2 - 47 KΩ @ R10,11
 —— 2 - 15 MΩ @ R9,13

*Match pin 1 of the following SIPs with pin 1 (white circle) on layout
 —— 1 - 3.3 KΩ 8-pin SIP* bussed @ S1
 —— 1 - 47 KΩ 8-pin SIP* isolated @ S2 (*NOT 4.7 KΩ)

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes
 —— 2 - 8-pin pin 1 → •
 —— 3 - 14-pin white
 —— 1 - 16-pin dot
 —— 2 - 20-pin
 —— 1 - 24-pin* Note corrected pin 1
 —— 1 - 28-pin

CAPACITORS C

—— 1 - 220 pF @ 220 pF
 —— 6 - 0.1 μF Monolithic @ .1 μF
 —— 1 - 10 μF/16V Tantalum* @ 10μF/16V

CONNECTORS

—— 2 - RCA female jacks, PCB mount @ TAPE IN, TAPE OUT
 —— 3 - 5-pin DIN plugs, PCB mount @ EX. DRUM, MIDI OUT, MIDI IN
 —— 1 - 2x13 header, right angle @ EX. CONN. (optional - use with external card in place of three 5-pin DIN plugs)

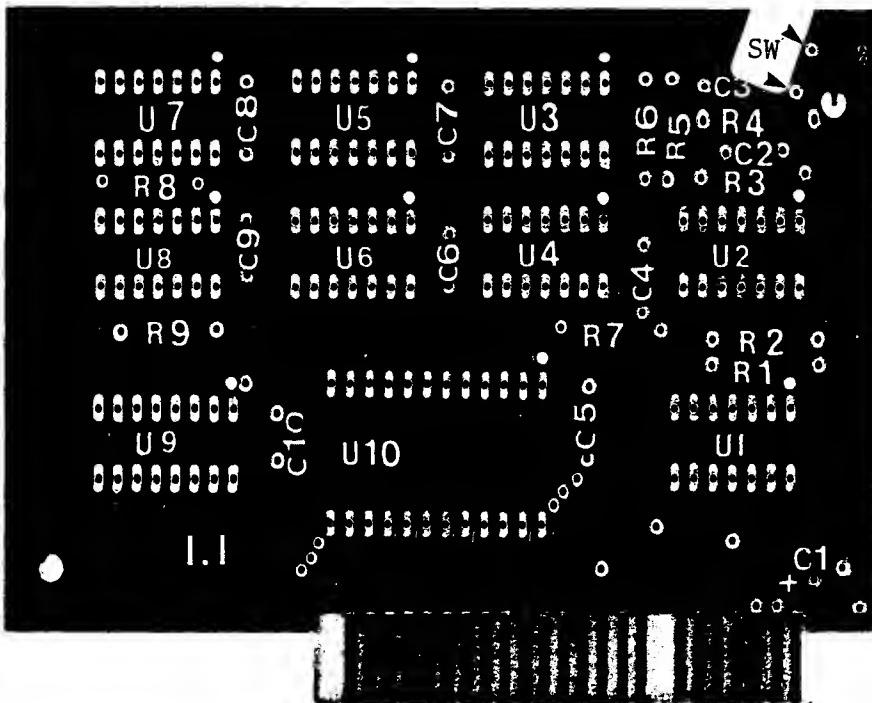
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

—— 1 - 7406
 —— 1 - 74LS00
 —— 1 - 74LS74
 —— 1 - 74LS138
 —— 1 - 74LS244
 —— 1 - 74LS245
 —— 1 - 6850 ACIA *Note corrected pin 1
 —— 1 - 6840 TIMER
 —— 1 - TL062 OP-AMP
 —— 1 - 6N138 OPTO-ISOLATOR



GUIDE 9-1

COPY CARD: Allows you to make back-up copies of your protected software.. With power off, install in any free slot except 0 or 6. Requires 16 K RAM card, firmware (one EPROM), and software (one disk).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 7 - 6.8 K Ω @ R1,2,5,6,7,8,9
- 2 - 100 Ω @ R3,4

CAPACITORS C

- 8 - 0.1 μ F Monolithic @ C3 to C10
 - 1 - 270 pF 2% silver mica @ C2
 - 1 - 2.2 μ F/25v Tantalum* @ C1
- *Match + of capacitor with + on layout

SOCKETS *Match pin 1 of socket with pin 1 on layout. Check that ALL pins have passed thru ALL holes.

- 8 - 14-pin
- 1 - 16-pin
- 1 - 24-pin

• ◀ pin 1



SWITCH AND CABLE

- 1 - pushbutton switch, single pole single throw (SPST)
- 2 - 50-60 cm lengths of insulated wire

SWITCH AND CABLE (continued)

Solder the two wires to the lugs of the switch and cover with insulation.

Slip the other end of the wires thru the large hole near R4. Tie a knot about 1-2 cm from the end to act as a "strain relief". Slip the leads thru the solder holes and solder to the solder side: i.e., Solder one lead to ground and the other lead to the solder pad connected to R4.

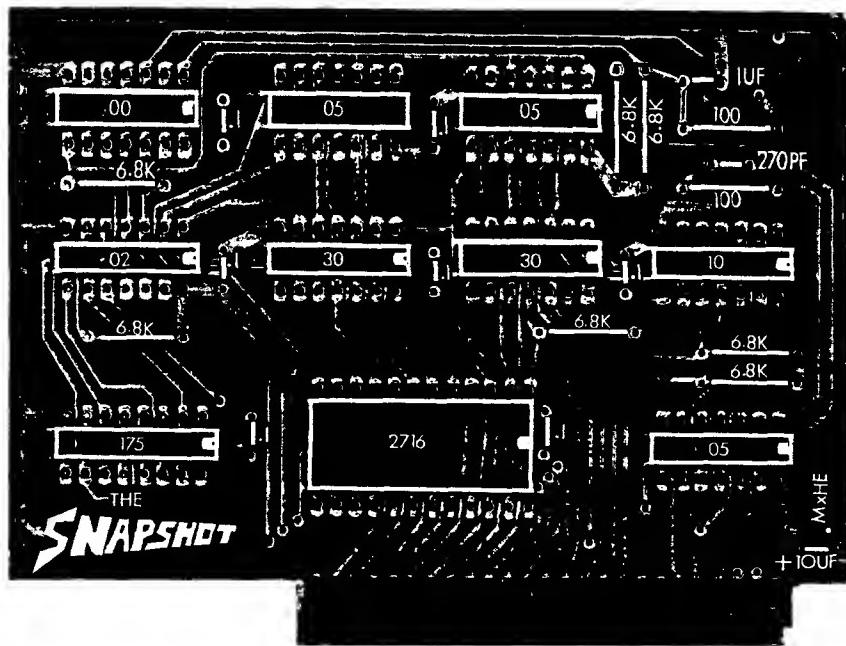
INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 (white dot) on layout

- 1 - 74LS00 @ U7
- 1 - 74LS02 @ U8
- 3 - 74LS05 @ U1,3,5
- 1 - 74LS10 @ U2
- 2 - 74LS30 @ U4,6
- 1 - 74LS175 @ U9
- 1 - 2716 EPROM @ U10



GUIDE 9-2

SNAPSHOT: Allows user to make backup copies of protected software. With power off, install in any slot except \emptyset . Requires 64 K of RAM, firmware (one EPROM), and software (one disk).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 2 - 100 Ω
- 7 - 6.8 K Ω

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 8 - 14-pin
- 1 - 16-pin
- 1 - 24-pin

CAPACITORS C

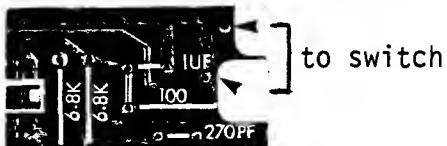
- 1 - 270 pF
- 8 - 0.1 μ F Monolithic @ positions labelled ".1"
- 1 - 10 μ F/16v radial *Match + of capacitor with + on layout

SWITCH & CABLE

- 1 - pushbutton switch, SPST (single pole-single throw)
- 2 - 50-75 cm lengths of insulated wire

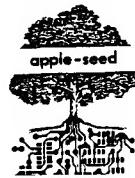
SWITCH & CABLE (continued)

Solder the ends of the two wires to the lugs of the switch and wrap with insulation. Pass the other end of each wire thru the holes of the component side as shown and solder them to the solder side.



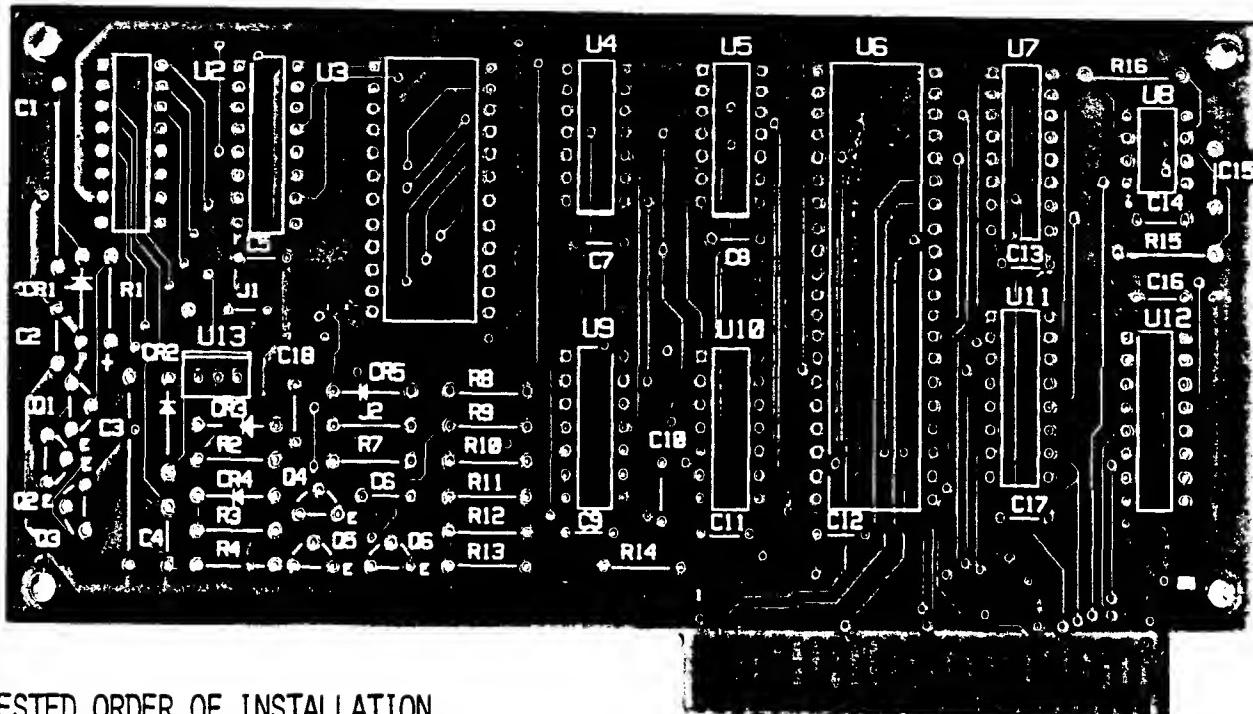
INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS00
- 1 - 74LS02
- 3 - 74LS05
- 1 - 74LS10
- 2 - 74LS30
- 1 - 74LS175
- 1 - 2716 EPROM



GUIDE 9-3

ROM BLASTER CARD: Allows user to read, write, or copy 2708-16-32 or 2508-16-32 EPROMS. With power off, insert in any slot except \emptyset . Requires software (one disk).



SUGGESTED ORDER OF INSTALLATION

*INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diode as shown

- 3 - 1N4001 @ CR1,2,4 cathode end
- 1 - 1N754A 6.2 V Zener @ CR3
- 1 - 1N751A 5.1 V Zener @ CR5

RESISTORS R $\frac{1}{2}$ watt, 5% *R5,6 is not silk-

- 1 - 10 Ω @ R3 screened on the card
- 1 - 50 Ω @ R4
- 1 - 390 Ω @ R7
- 2 - 1 K Ω @ R1,15
- 1 - 2.2 K Ω @ R9
- 2 - 2.7 K Ω @ R10,11
- 1 - 6.8 K Ω @ R8
- 3 - 10 K Ω @ R2,12,13
- 1 - 47 K Ω @ R16
- 1 - 1.5 M Ω @ R14

JUMPER

- 2 - @ J1,2

SOCKETS *Match pin 1 of sockets with pin 1 (square pad) on the layout. Check that ALL pins have passed thru ALL holes

SOCKETS (continued)

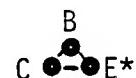
- 1 - 8-pin pin 1 upper left for ALL sockets
- 4 - 14-pin
- 5 - 16-pin
- 1 - 40-pin
- - - Personality Select Sockets
- 1 - EPROM Socket, Zero Insertion Force (ZIF)

CAPACITORS C

- 1 - 0.001 μ F @ C15
- 15 - 0.1 μ F @ C2,4,5,6,7,8,9,10,11, C12,13,14,16,17,18
- 2 - 22 μ F/63v Axial* @ C1,3 *Match + of capacitors with + on the layout

TRANSISTORS Q *Match the three EBC transistor leads correctly

- 3 - 2N5550 or 2N5551 @ Q1,2,3
- 2 - 2N2907 @ Q4,5
- 1 - 2N2222A @ Q6



*Only E is silk-screened on the layout
(continued)



ROM BLASTER CARD (continued)

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 (white dot) on the layout.

Refer to SOCKETS for U1 & U3

1 - CD4040B @ U2 12-stage binary/ripple counter

1 - 74LS02 @ U4

1 - 74LS04 @ U5

1 - one of

6820 or)

6821 or) @ U6 Peripheral Interface Adapter (PIA)

6521)

3 - 74LS367 @ U7,11,12

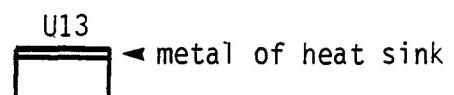
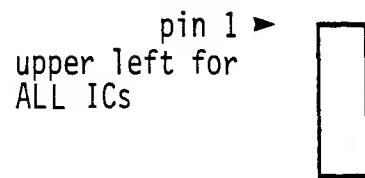
1 - NE555 @ U8 Timer

1 - 7407 @ U9 Hex inverter buffer/driver

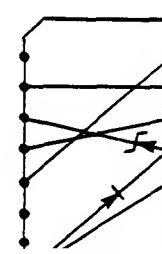
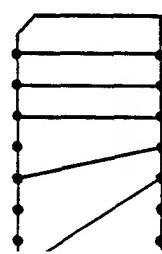
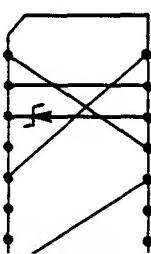
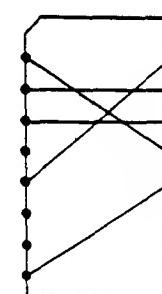
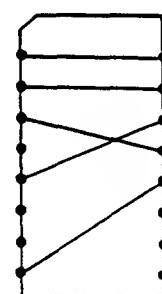
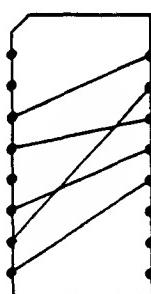
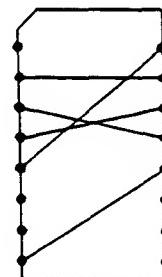
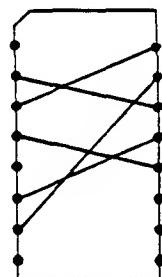
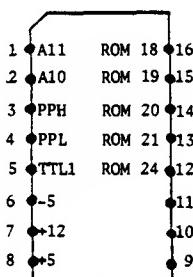
1 - 74LS00 @ U10

1 - 7820 @ U13 20 V voltage regulator*

*Position metal (heat sink) of
voltage regulator along the
double bar on the layout



PERSONALITY SELECT SOCKETS: plug-in adapters (16-pin component carriers strapped as shown) are used to reconfigure the programming socket to match the type of EPROM being programmed.



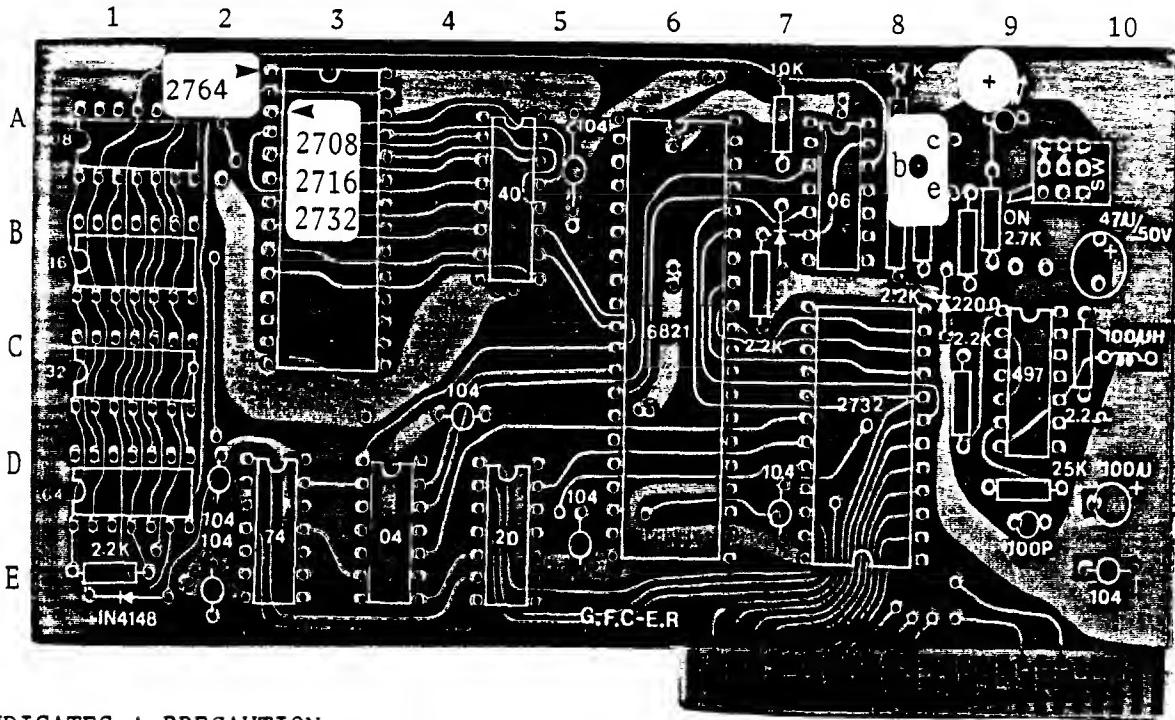
Use diodes as shown when
programming 2732A or
2815/2816 EPROMS:

2 - 1N5231 5.1V Zeners

1 - 1N4001

EPROM PROGRAMMER: Allows user to read, write or copy 2708, 16, 32, 64 and 2532, 64. With power off, install in any slot between 1 & 5. Requires firmware (one EPROM).

*NOTE THE
COMPONENT
CHANGES



SEQUENCE *INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diode as shown

— 3 - 1N4148 

— 1 - LED *Position longer lead (+) of LED as shown on the layout @ A-9

RESISTORS $\frac{1}{4}$ watt, 5% (unless indicated)

- 1 - 10 K Ω @ A7
- 1 - 4.7 K Ω @ A8
- 1 - 2.2 K Ω @ B8
- 1 - 100 Ω @ B8-9 in place of 1 K Ω
- 1 - 22 Ω @ B8-9 in place of 220 Ω
- 1 - 4.7 K Ω @ B9 in place of 2.7 K Ω
- 1 - 2.2 K Ω @ B-C7
- 1 - 1.0 Ω , $\frac{1}{2}$ W @ C10 in place of 2.2 Ω
- 1 - 1 K Ω @ C-D9 in place of 2.2 K Ω
- 1 - 22 K Ω , $\frac{1}{2}$ W @ D9 in place of 25 K Ω
- 1 - 2.2 K Ω @ E1

INDUCTOR L

- 1 - 100 uH RF choke

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 9 - 14-pin
- 1 - 16-pin
- 1 - 24-pin

CAPACITORS C

- 1 - 100 pF
- 5 - 0.1 uF Monolithic *delete 2 caps at A-B5 & E2
- 1 - 22 uF/16v Tantalum* @ D10
- 1 - 33 uF/16v Radial* @ B10 *Match + of capacitors with + on layout

INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 on layout

- 1 - 74LS04
- 1 - 74LS20
- 1 - 74LS74 for ALL sockets
- 1 - CD4040
- 1 - TL497 & ICs
- 1 - 7406
- 1 - 6821P
- 1 - 2716 EPROM

TRANSISTOR Q

- 1 - 2N3904 *Install the EBC leads as shown on the layout

SWITCH

- 1 - SPST PCB mount @ SW

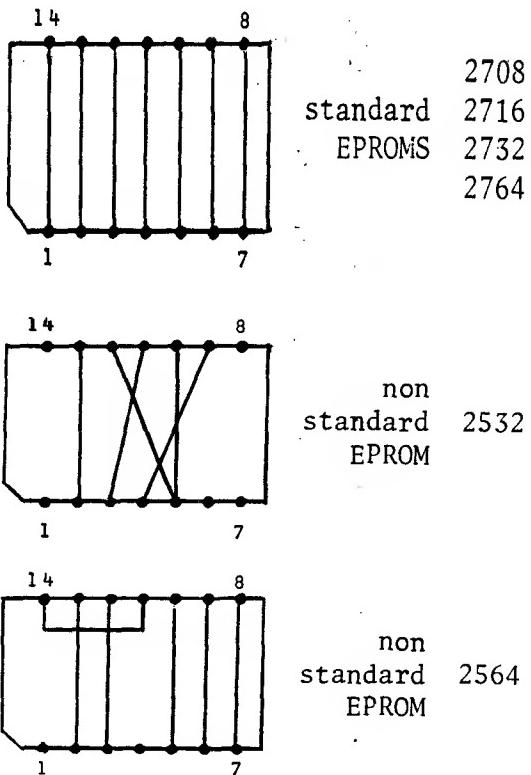
(continued)



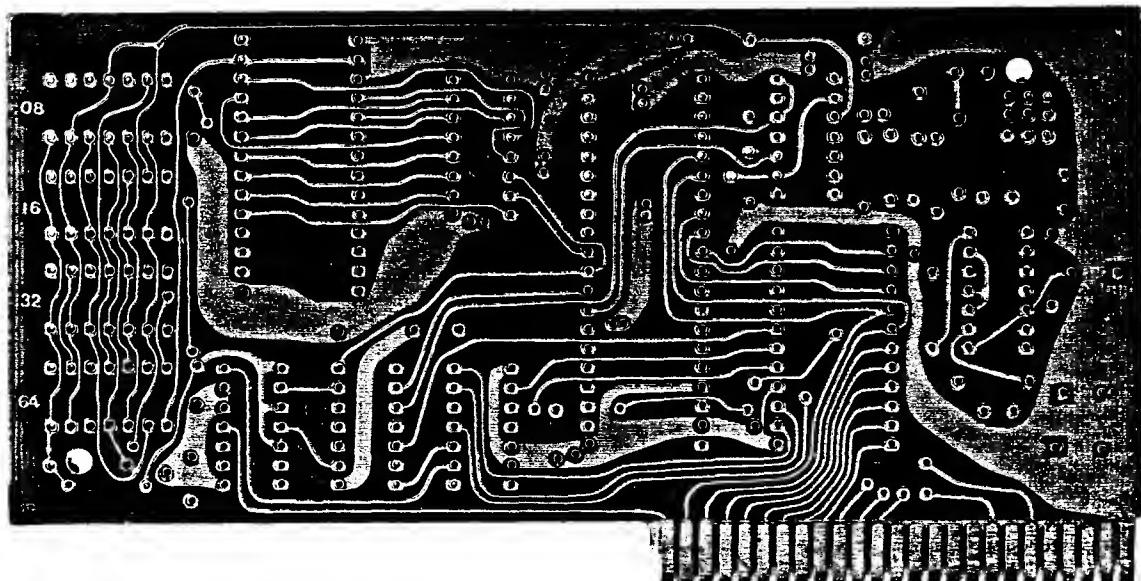
EPROM PROGRAMMER (continued)

PERSONALITY SELECT SOCKETS

Plug-in adapters (14-pin component carriers strapped as shown) are used to reconfigure the programming sockets (labelled on the layout) to match the type of EPROM being programmed.

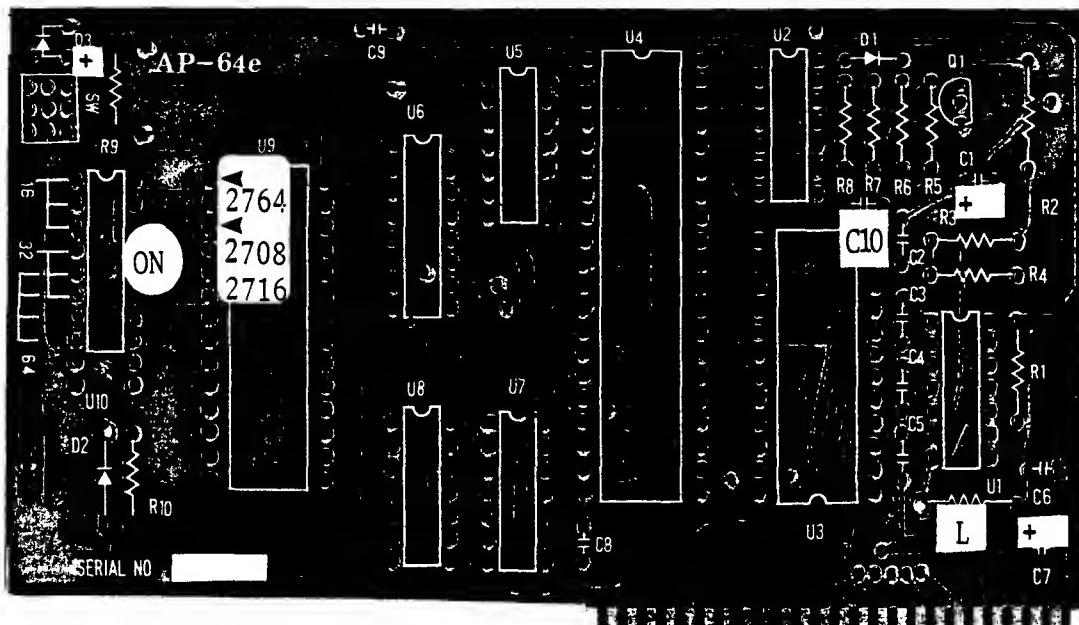


EPROM PROGRAMMER: The component side of this card is NOT silk-screened. Refer to the Guide on the previous page for component placement.



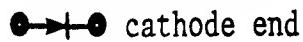
GUIDE 9-5

AP-64 EPROM WRITER: Burns 2716-32-64 EPROMS. Functions include: write, read, copy, verify, blank check, monitor. Requires firmware (one EPROM) and documentation.



SEQUENCE *INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diode as shown



2 - 1N4001 @ D1,2

— 1 - LED *Position longer lead(+) as shown an the layout @ D3

RESISTORS R $\frac{1}{4}$ watt, 5%

— 1 - 1 Ω @ R1

— 1 - 27 Ω @ R7

— 1 - 100 Ω @ R10

— 1 - 120 Ω @ R6

— 1 - 680 Ω @ R4

— 3 - 4.7 K Ω @ R5,8,9

— 1 - 10 K Ω @ R3

— 1 - 5 K Ω 2-cm rectangular trimpot, multi-turn adjustment @ R2

INDUCTOR L

— 1 - 100 μ H @ L

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

— 5 - 14-pin

— 1 - 16-pin

— 1 - 24-pin

— 1 - 40-pin

— 1 - 28-pin ZIF (Zero-Insertion Force)

CAPACITORS C

— 1 - 100 pF disc ceramic @ C4

— 7 - 0.1 μ F Tantalum @ C2,3,5,7,8,

CAPACITORS (continued)

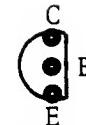
— 1 - 2.2 μ F/25V Radial* @ C1

— 1 - 10 μ F/16V Radial* @ C6

*Match + of Radials with + on the layout

TRANSISTOR Q *Position the EBC leads as shown

— 1 - 2N3904 @ Q1



SWITCHES

— 1 - SPST @ SW *up position for "on"

— 1 - 8-position DIP @ U10, select as shown:

2716 - 1,2,3 on

2732 - 4,5,6 on

2764 - 5,6,7,8 on

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

— 1 - 74LS04 @ U5

pin 1 ►

for all sockets
and ICs

— 1 - 74LS20 @ U7

— 1 - 74LS74 @ U8

— 1 - CD4040 @ U6

— 1 - TL497 @ U1

— 1 - 7406 @ U2

— 1 - 6821P @ U4

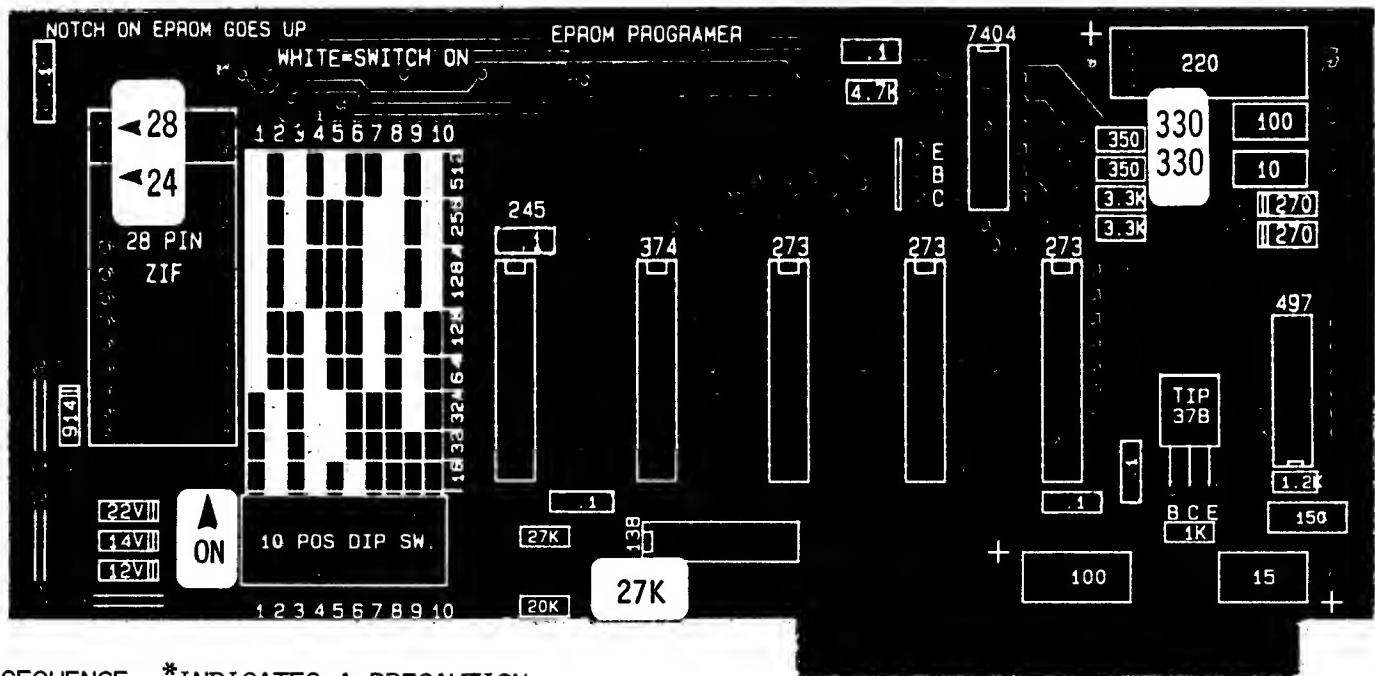
— 1 - 2716 EPROM @ U3



NOTE: Adjust trimpot @ R2 for correct voltage as outlined in the documentation

GUIDE 9-6

SUPER BURNER: Read, program any standard single-voltage EPROM including 27---- series 08, 16, 32, 32A, 64, 64A, 128, 128A, 256, 512 at either fast or normal burn speeds. With power off, install in any slot. Requires software (one diskette).



SEQUENCE *INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diode as shown



- 2 - 1N270 @ 270
- 1 - 1N914 @ 914
- 1 - 12V 500 mw Zener @ 12V
- 1 - 14V 500 mw Zener @ 14V
- 1 - 22V 500 mw Zener @ 22V

RESISTORS R $\frac{1}{2}$ watt, 5% *Except 9.1 Ω

- 1 - 9.1 Ω @ 10 $*\frac{1}{2}$ watt, 5%
- 2 - 330 Ω @ 350
- 1 - 1 K Ω @ 1K
- 1 - 1.2 K Ω @ 1.2K
- 2 - 3.3 K Ω @ 3.3K
- 1 - 4.7 K Ω @ 4.7K
- 2 - 27 K Ω @ 20K & 27K

COIL (RF CHOKE) L

- 1 - 100 μ H @ 100

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 2 - 14-pin
- 1 - 16-pin
- 5 - 20-pin
- 1 - 28-pin ZIF (Zero Insertion Force)

TRANSISTORS Q *Match EBC leads of transistors with EBC on the layout

- 1 - 2N3904 @ Q1

CAPACITORS C

- 1 - 150 pF @ 150
- 6 - 0.1 μ F Monolithic @ .1

*Match + of the following AXIAL capacitors with + on the layout

- 1 - 15 μ F/25V axial* @ 15
- 1 - 100 μ F/16V axial* @ 100
- 1 - 220 μ F/50V axial* @ 220

SWITCH *Note "ON" position

- 1 - 10-position DIP for EPROM select

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS07 @ 7404
- 1 - 74LS138
- 1 - 74LS245
- 3 - 74LS273
- 1 - 74LS374
- 1 - TL497ACN



SWITCH SETTINGS Set DIP switches ON according to the chart on the layout

e.g. For 2716 set # 2,4,6 ON

THE FOLLOWING ARE NOT SHOWN ON THE CHART:

For 2708 set #2,4,6 ON (as for 2716)

For 2764A set #1,4,7,8 on

For Toshiba 27256

set #1,3,7,9 ON

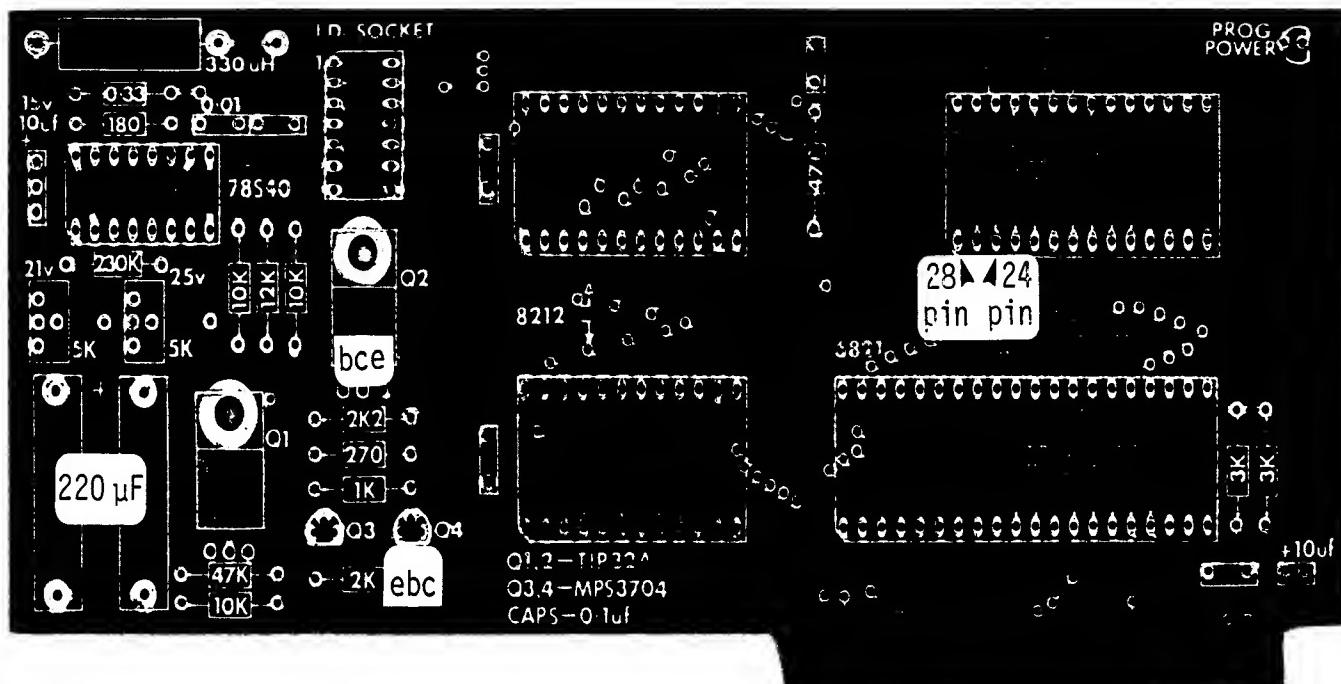
Jumpers:

- 3 - strap @



GUIDE 9-7

EXCEL BURNER: Allows user to read, write, copy 2716, 1732, 2732A & 2764 EPROMs.
With power off, install in any slot. Requires software (one diskette).



SUGGESTED SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 0.33 Ω *2 watt
- 1 - 180 Ω
- 1 - 270 Ω
- 1 - 470 Ω
- 1 - 1 K Ω
- 1 - 2 K Ω
- 1 - 2.2 K Ω
- 2 - 3 K Ω
- 3 - 10 K Ω
- 1 - 12 K Ω
- 1 - 47 K Ω
- 1 - 230 K Ω
- 2 - 5 K Ω Trimpot

SOCKETS *Match pin 1 of sockets with pin

1 on the layout. Check that ALL pins have passed thru ALL holes

- 1 - 14-pin
- 1 - 16-pin
- 2 - 24-pin
- 1 - 40-pin
- 1 - 28-pin ZIF (Zero-Insertion Force)

CAPACITORS C

- 1 - 0.01 μF
- 4 - 0.1 μF Monolithic @
- *Match + of the following capacitors with + on the layout
- 2 - 10 μF /16V Tantalum*
- 2 - 220 μF /25V Axial* @ 220 μF

TRANSISTORS Q *Match ebc leads of transistors with ebc on the layout

- 2 - MPS3704 @ Q1
- 2 - TIP32A @ Q1,2 Secure the top of the TIP32A transistors to the card with two nuts and bolts

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

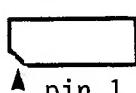
- 1 - UA78S40
- 2 - 8212
- 1 - 6821

LIGHT EMITTING DIODE

- 1 - LED @ PROG POWER

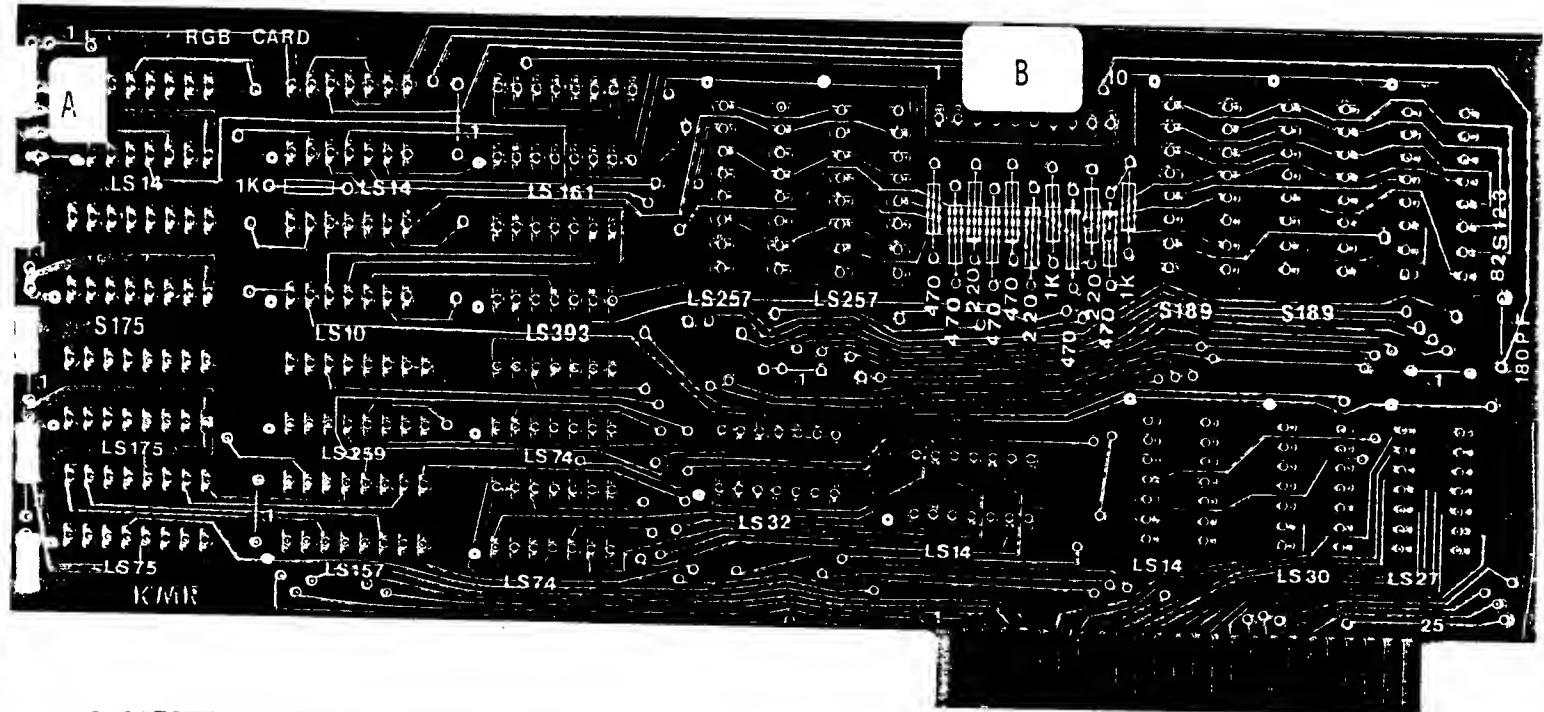
INDUCTOR L

- 1 - 330 μH



GUIDE 10-1

RGB CARD: Allows the user to interface an RGB colour monitor to the computer. With power off, install in slot number 7.



SUGGESTED ORDER OF INSTALLATION

* INDICATES A PRECAUTION

RESISTORS: R $\frac{1}{4}$ watt. 5%

— 3 - 220 Ω
 — 5 - 470 Ω
 — 3 - 1 KΩ

CAPACITORS: C

— 8 - 0.1 μ F Monolithic
1 - 180 pF Disc

SOCKETS: *Match pin 1 of sockets with
pin 1 (white dot) on the layout.
Check that ALL pins have passed
thru ALL holes

_____ 11 - 14-pin
_____ 11 - 16-pin

CONNECTORS:

- 1 - 1x4 male header strip, right-angle
@ A on the layout for input from
motherboard
- 1 - 1X10 male header strip, straight
@ B on the layout for output
to RGB monitor

Refer to appropriate user manual
for correct interfacing

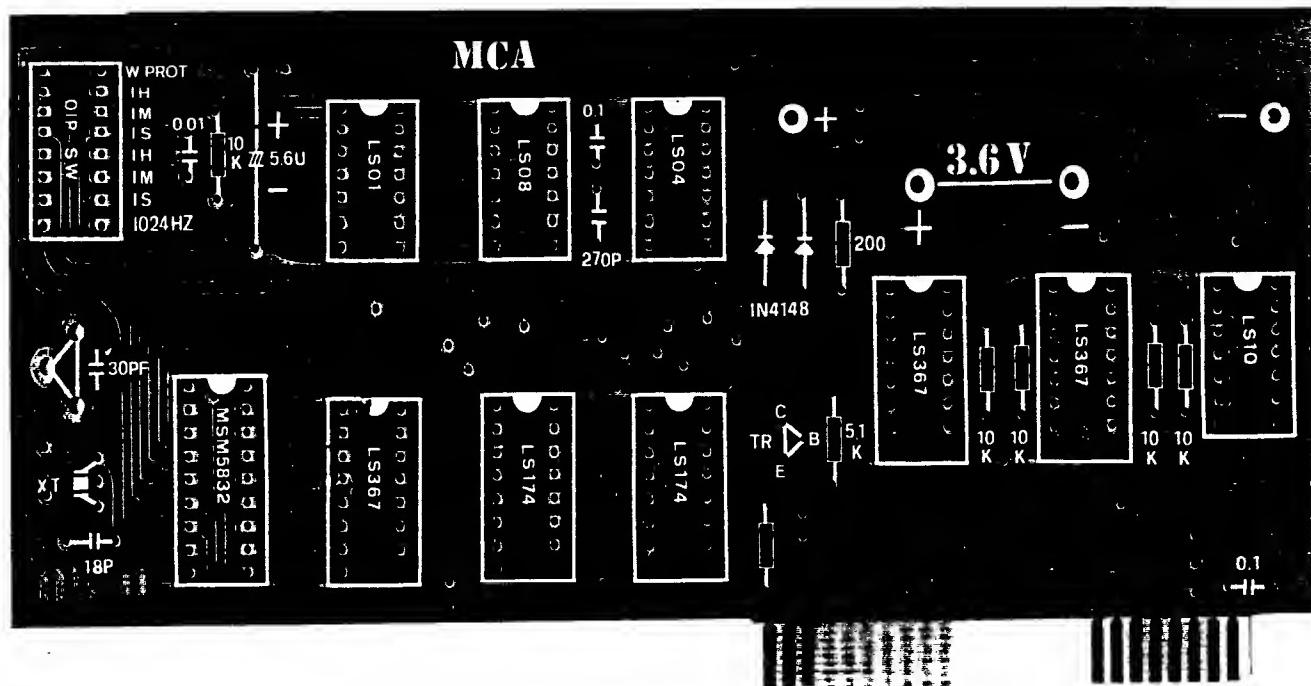
INTEGRATED CIRCUITS: *Match pin 1 of IC
with pin 1 (white dot) on layout

- 1 - 74LS10
- 4 - 74LS14
- 1 - 74LS27
- 1 - 74LS30
- 1 - 74LS32
- 2 - 74LS74
- 1 - 74LS75
- 1 - 74LS157
- 1 - 74LS161
- 1 - 74LS175
- 2 - 74LS257
- 1 - 74LS259
- 1 - 74LS393
- 1 - 74S175
- 2 - 74S189
- 1 - 82S123 B



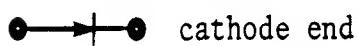
GUIDE 10-2

TIME CARD: Real time clock/calendar with on board battery backup power, charges when the computer is on. With power off, install in any slot except Ø (slot 5 recommended). Requires software (one disk).



SEQUENCE *INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diode as shown



2 - 1N4148

RESISTORS R $\frac{1}{4}$ watt, 5%

1 - 200 Ω

1 - 5.1 Ω

5 - 10 K Ω

1 - 680 Ω @ position unlabelled

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

4 - 14-pin

5 - 16-pin

1 - 18-pin

CAPACITORS C

1 - 18 pF

1 - 270 pF

1 - 0.01 μ F

2 - 0.1 μ F

1 - 30 pF variable capacitor

1 - 5.6 μ F/16v axial*

*Match + of capacitor with + on the layout

TRANSISTOR Q *Install the three EBC transistor leads correctly

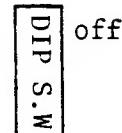
1 - 2N3904 @ TR

CRYSTAL Y

1 - 32.708 KHz @ XT on off

SWITCH

1 - 8-position DIP S.W



BATTERY

1 - 3.6 V NiCad rechargeable appropriately mounted

INTEGRATED CIRCUITS *Match pin 1 of IC with pin 1 on layout

1 - 74LS01

1 - 74LS04

1 - 74LS08

1 - 74LS10

2 - 74LS174

3 - 74LS367

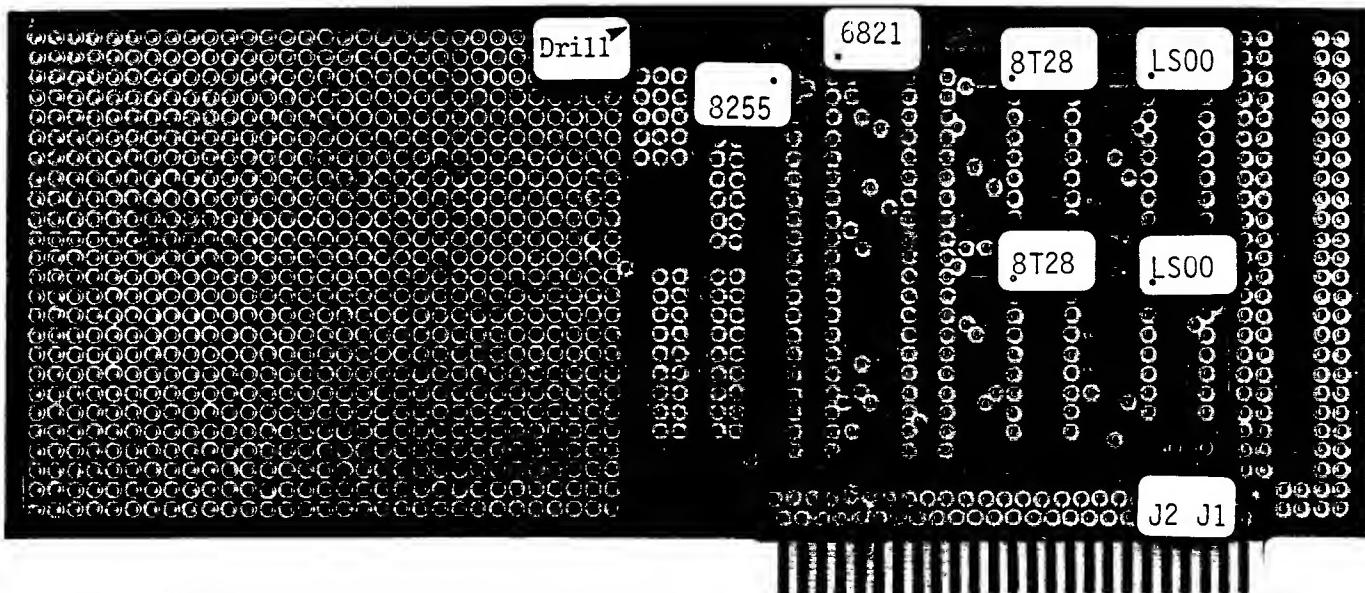
1 - MSM5832 real time clock/calender (OKI)



NuScope
Associates

GUIDE 10-3

INPUT/OUTPUT CARD: Universal interface card with prototyping area for custom design. Install either Peripheral Interface Adapter MPU or Programmable Interface Adapter MPU.



SEQUENCE *INDICATES A PRECAUTION

SOCKETS *Match pin 1 of sockets with pin 1 (dot) on the layout. Check that ALL pins have passed thru ALL holes

- 2 - 14-pin
- 2 - 16-pin
- 1 - 40-pin

CONNECTORS

- 2 - 2-pin male header, straight @ J1,2

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 2 - 74LS00 quad 2 input NAND gate
- 2 - 8T28 quad tri-state bus transeiver

ONE OF THE FOLLOWING:

- 1 - 6821 Peripheral Interface Adapter
*Note pin 1 position

OR

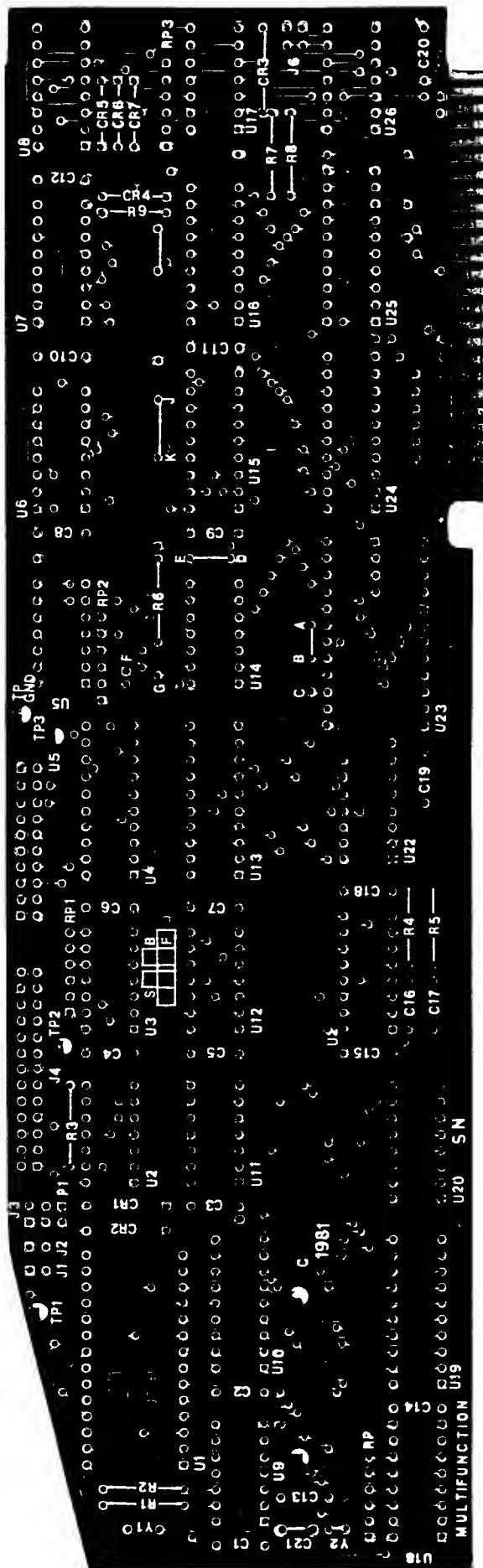
- 1 - 8255 Programmable Interface Adapter
*Note pin 1 position

MODIFICATION: If necessary, drill the feed-thru hole labelled "Drill" on the layout to prevent a short between GND & +5V



GUIDE 10-4

MULTIFUNCTION CARD: Provides an interface between the computer & external support devices including a bi-directional serial port, a parallel output interface, & a real-time clock/calender. With power off, install in any slot except #. Requires firmware (one EPROM), software (one disk), & documentation.



* INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diodes towards the "square" pad
6 - 1N4148 @ CR1,2,3,4,5,6

RESISTORS R $\frac{1}{4}$ watt, 5%
1 - 51 Ω @ CR7*NOT an R number
1 - 100 Ω @ R3
1 - 510 Ω @ R9
1 - 620 Ω @ R6
2 - 1 K Ω @ R7,8
2 - 1.5 K Ω @ R1,2
1 - 10 K Ω @ R4
1 - 20 K Ω @ R5
2 - 10 K SIP* @ RP1,4
1 - 1 K SIP* @ RP2
1 - 10 K SIP* @ RP3

CAPACITORS C
1 - 10 pF/100V Mica @ C13
1 - 100 pF/500V Mica @ C16,17
17 - 0.1 μ F Monolithic @ C1,2,3,4,5,6
C7,8,9,10,11,12,14,15,18,19,20
1 - 0-50 pF Trimcap @ C21

CONNECTORS
Match pin 1 of SIPS with "square" solder pad (GND)

COMPONENT SIDE

SOCKETS *Match pin 1 of sockets with pin 1 CONNECTORS (Cont) Headers are straight (square pad) on the layout. Check that
ALL pins pass thru ALL holes

10 - 14-pin
6 - 16-pin pin 1 lower left for ALL sockets

CRYSTAL Y
1 - 32.768 KHz (CLOCK) @ Y2
1 - 5.0688 MHz (UART) @ Y1

BATTERY
2 - 1.5 alkaline (AA) @ P1*
Mount battery with +ve red
appropriate holder J2 ● ● P1*

on solder side & secure with ties
4 - terminal posts @ TP1,2,3,TP-GND



(Continued)

MULTIFUNCTION CARD (Continued)

FLAT RIBBON CABLES

- 1 - serial, 26-conductor to 25-pin "D" connector
- 1 - parallel, 20-conductor to 36-pin "Centronics" style connector

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS03 @ U5
- 1 - 74LS04 @ U9
- 1 - 74LS08 @ U17
- 1 - 74LS09 @ U14
- 2 - 74LS32 @ U22,26
- 1 - 74LS74 @ U12
- 1 - 74LS123 @ U21
- 1 - 74LS136 @ U3
- 2 - 74LS138 @ U6,7
- 1 - 74LS155 @ U8
- 1 - 74LS173 @ U18
- 2 - 74LS273 @ U13,19
- 1 - 74LS357 (T.I.) @ U25
- 1 - 74LS367 @ U20
- 1 - 74LS374 @ U4



pin 1 lower left for
ALL ICs

INTEGRATED CIRCUITS (Continued)

- 1 - 2716 EPROM @ U23
- 1 - 8T245 or 74F245 @ U24
- 1 - INS2651N (NAT) @ U1
- 1 - 75188 (MC1488) @ U11
- 1 - 75189 (MC1489) @ U2
- 1 - MSM5832 MPU (OKI) real time clock/calender @ U10
- 2 - HM-6513-9 512x4 CMOS static RAM (NAT), (HAR) @ U15,16

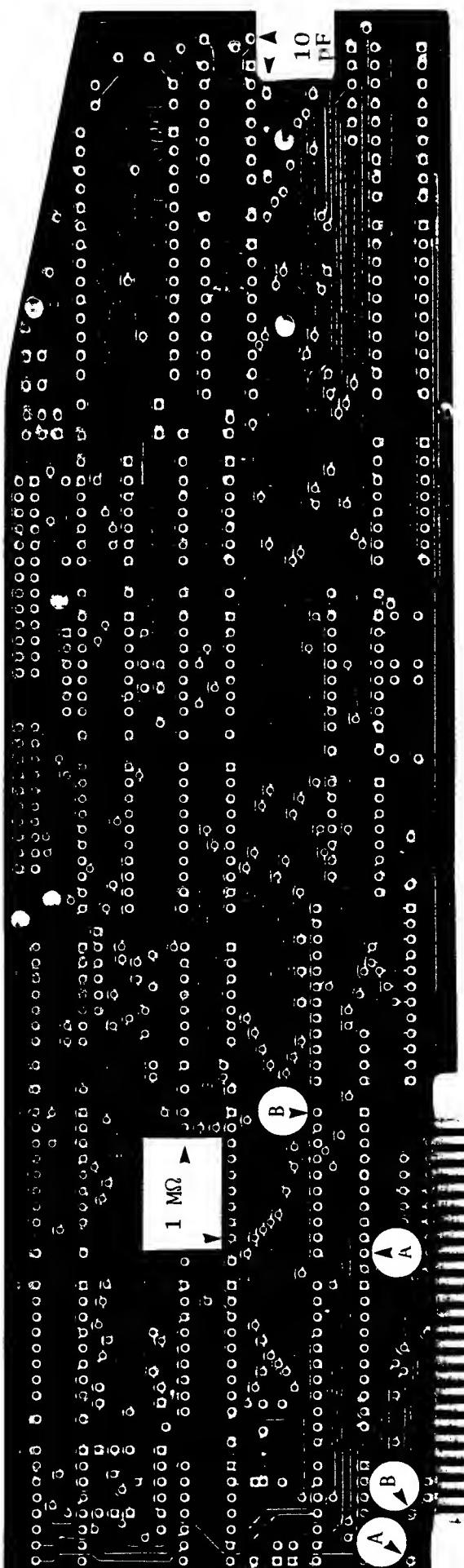
MODIFICATIONS TO THE SOLDER SIDE: Refer to the layout below

- 1 - 10 pF/100V Mica capacitor @ pin 1 of U9 to bus strip directly below
- 1 - 1 MΩ resistor @ U15, pin 9 to U15, pin 17

CONNECT insulated jumper wires on the SOLDER SIDE as shown

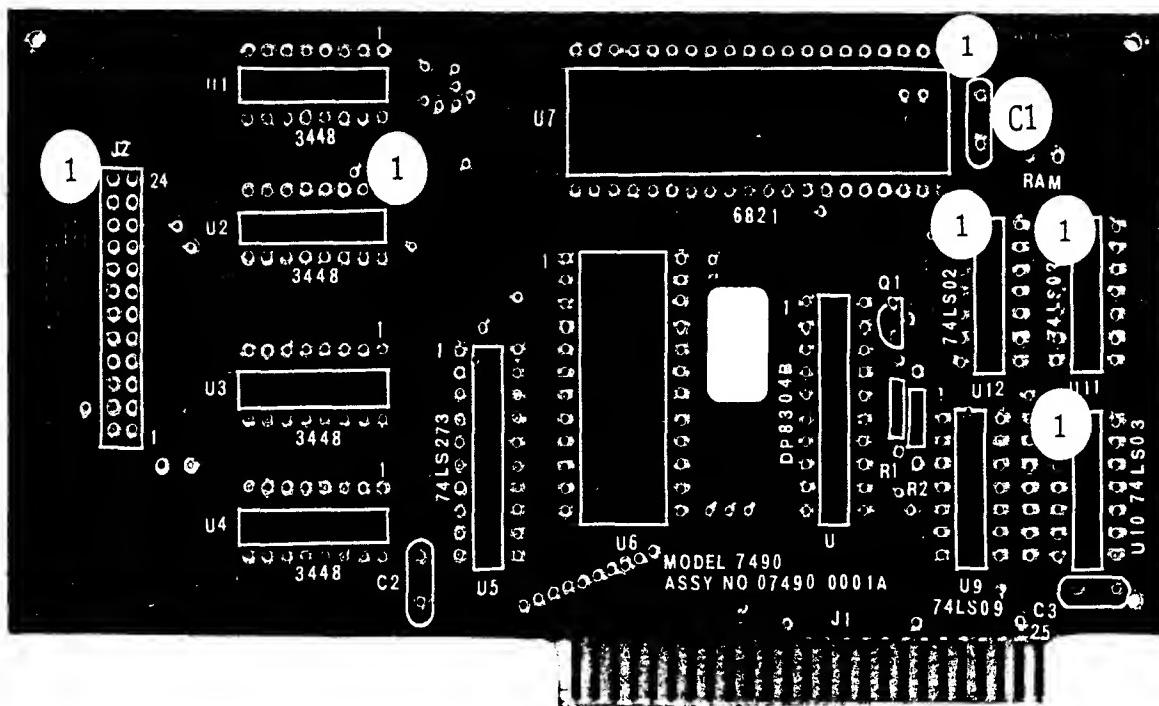
- 1 - pin 10 of U24 to interface pin 26 (GND) of edge card connector @ A-A
- 1 - pin 20 of U24 to interface pin 25 (+5V) of edge card connector @ B-B

MODIFICATIONS TO THE SOLDER SIDE



GUIDE 10-5

IEEE-INSTRUMENT CONTROLLER CARD: A parallel communication interface between the host computer and digitally-controlled equipment (for test, measure and control). Supports the instrument bus sanctioned by the IEEE. With power off, install in any slot except \emptyset (slot 3,4, or 5 recommended). Requires firmware (one EPROM) and documentation.



SEQUENCE *INDICATES A PRECAUTION

RESISTORS $\frac{1}{4}$ watt, 5%

— 2 - 220 Ω @ R1,2

— 1 - 2.2 K Ω 8-pin SIP between U9 & U10

*Pin 1 (common) is directly between U12 & U11

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes.

— 4 - 14-pin pin 1 ► 1
— 4 - 16-pin for ALL
— 2 - 20-pin sockets
— 1 - 24-pin and ICs
— 1 - 40-pin



CAPACITORS C

— 3 - 0.1 uF Monolithic @ C1 (between U7 & "RAM"), C2, C3

TRANSISTOR Q *Install the three EBC leads as shown

— 1 - 2N3906 @ Q1



CONNECTOR

— 1 - 2x12 male header strip, straight @ J2

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

— 4 - 3448 @ U1,2,3,4
— 1 - 74LS273 @ U5
— 1 - 2716 EPROM @ U6
— 1 - 6821 PIA @ U7
— 1 - DP8304B @ U ("8" is missing)
— 1 - 74LS09 @ U9
— 1 - 74LS03 @ U10
— 1 - 74LS00 @ U11
— 1 - 74LS02 @ U12

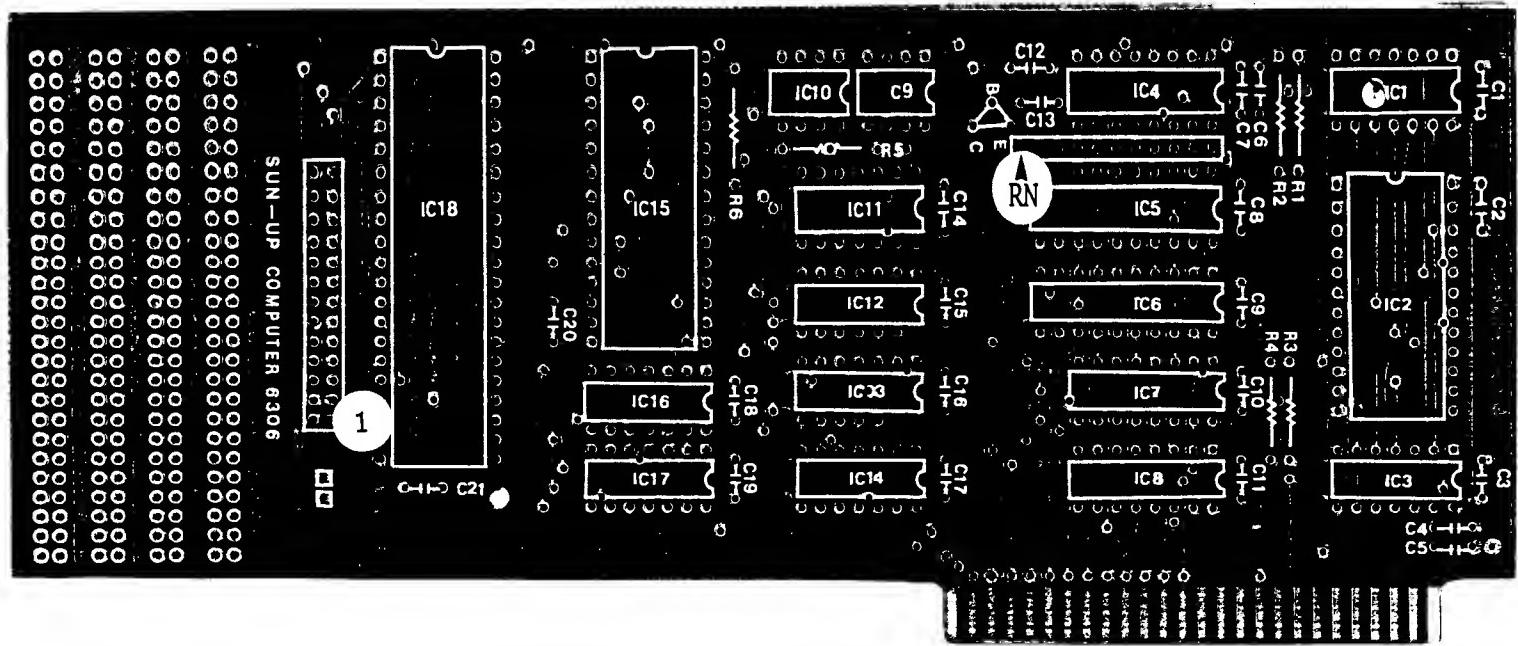
RAM OPTION

— 1 - 1x2 male header strip, straight @ RAM
Jumper the two pins and replace the EPROM with 2K x 8 RAM @ U6



GUIDE 10-6

A/D-D/A CARD: A data acquisition, recording, and monitoring system. Has on-board 8-channel (optional 16-channel) analog to digital converter, as well as expandable 1-channel digital to analog converter. With power off, install in slot number 2. Requires software (one disc).



SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

— 4 - 4.7 K Ω @ R1,2,3,4,5

— 1 - 10 K Ω 11-pin trimpot @ RN*

*Position common pin as shown by the arrow

— 1 - 100 K Ω 2 cm rectangular trimpot,
multiturn @ R6

SOCKETS *Match pin 1 of sockets with pin
1 on the layout. Check that ALL
pins have passed thru ALL holes

— 2 - 8-pin

— 8 - 14-pin

— 3 - 16-pin

— 2 - 20-pin

— 1 - 24-pin

— 1 - 28-pin

— 1 - 40-pin

CAPACITORS C

— 1 - 100 pF @ C8

— 20 - 0.1 uF Monolithic @ C1,2,3,4,5,6,7
C8,9,10,11,12,13,14,15,16,
C17,18,19,20,21

TRANSISTOR Q *Position the three EBC leads
correctly

— 1 - 2N3904

CONNECTOR

— 1 - 2x13 male header strip, straight

INTEGRATED CIRCUITS *Match pin 1 of ICs
with pin 1 on the layout

— 1 - 74LS00 @ IC16

— 3 - 74LS02 @ IC1,3,14

— 1 - 74LS04 @ IC17

— 1 - 74LS32 @ IC32

— 2 - 74LS74 @ IC11,13

— 2 - 74LS365 @ IC7,8

— 2 - 74LS373 @ IC5,6

— 1 - DM74159 @ IC2

— 1 - DAC0808 @ IC4

— 1 - ADC0808 @ IC15 *For 8-channel

— 1 - MC1456 @ IC9

— 1 - - @ IC10

— 1 - ADC0816 @ IC18 *For 16-channel

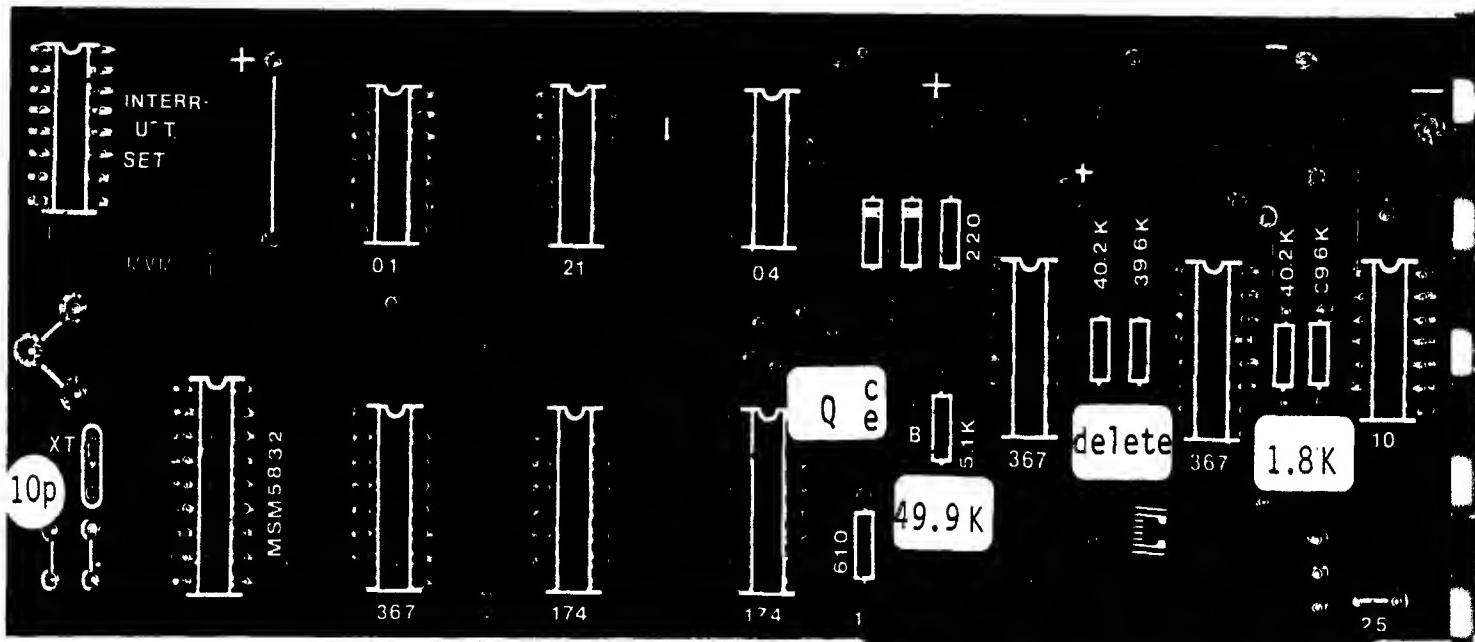
*USE EITHER IC15
OR IC18 BUT NOT BOTH

CABLE

— 1 - to suit



K-CLOCK CARD: Real-time clock/calender with 3.6 V rechargeable battery on board. Battery charges when computer is on. With power off, install in any slot except Ø (slot 5 recommended). Requires software (one disc).



SUGGESTED ORDER OF INSTALLATION *A PRECAUTION

DIODES D *Position banded end (cathode) of diode as shown



cathode end

2 - 1N4148

RESISTORS R $\frac{1}{4}$ watt, 1% except 220 Ω

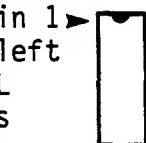
1 - 220 Ω 5%

1 - 619 Ω @ 610

2 - 1.80 K Ω

1 - 49.9 K Ω

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes



4 - 14-pin

upper left

5 - 16-pin

for ALL

1 - 18-pin

sockets

CAPACITORS C

and ICs

1 - 10 pF

3 - 0.1 μ F

1 - 10 μ F/40V Axial *Match + of axial with+ on the layout

1 - 30 pF variable capacitor

TRANSISTOR Q Install the EBC leads as shown on the layout

1 - 2N3904 @ Q

CRYSTAL Y

1 - 32.708 KHz @ XT

SWITCH

1 - 8-position DIP @ INTERRUPT SET

BATTERY

1 - 3.6 V NiCad, rechargeable appropriately mounted

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

1 - 74LS01

1 - 74LS04

1 - 74LS10

1 - 74LS21

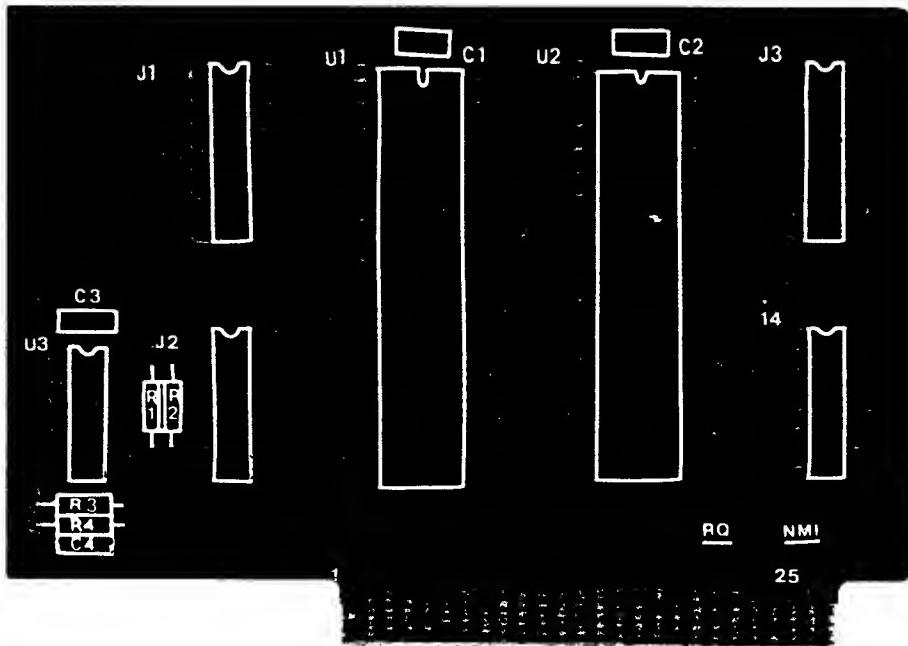
2 - 74LS174

3 - 74LS367

1 - MSM5832 (OKI) real-time clock/calender

GUIDE 10-8

6522 VIA: Allows user to perform I/O and timing/counting functions in 6502-based systems. The 6522 VIA chip shares the same bus and control signals provided by the 6502 MPU. Has four 16-pin sockets for connection to peripheral devices. With power off, install in any slot except \emptyset . Requires documentation.



SUGGESTED SEQUENCE *INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%
 _____ 2 - 1 K Ω @ R1,2
 _____ 2 - 4.7 K Ω @ R3,4

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes
 _____ 1 - 14-pin
 _____ 2 - 40-pin
 _____ 4 - 16-pin for connection to peripheral devices via ribbon cables

CAPACITORS C
 _____ 3 - 0.1 μ F Monolithic @ C1,2,3
 _____ 1 - 100 pF Disc @ C4

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout
 _____ 1 - 74LS05
 _____ 2 - R6522P VIA (versatile interface adapter) IC

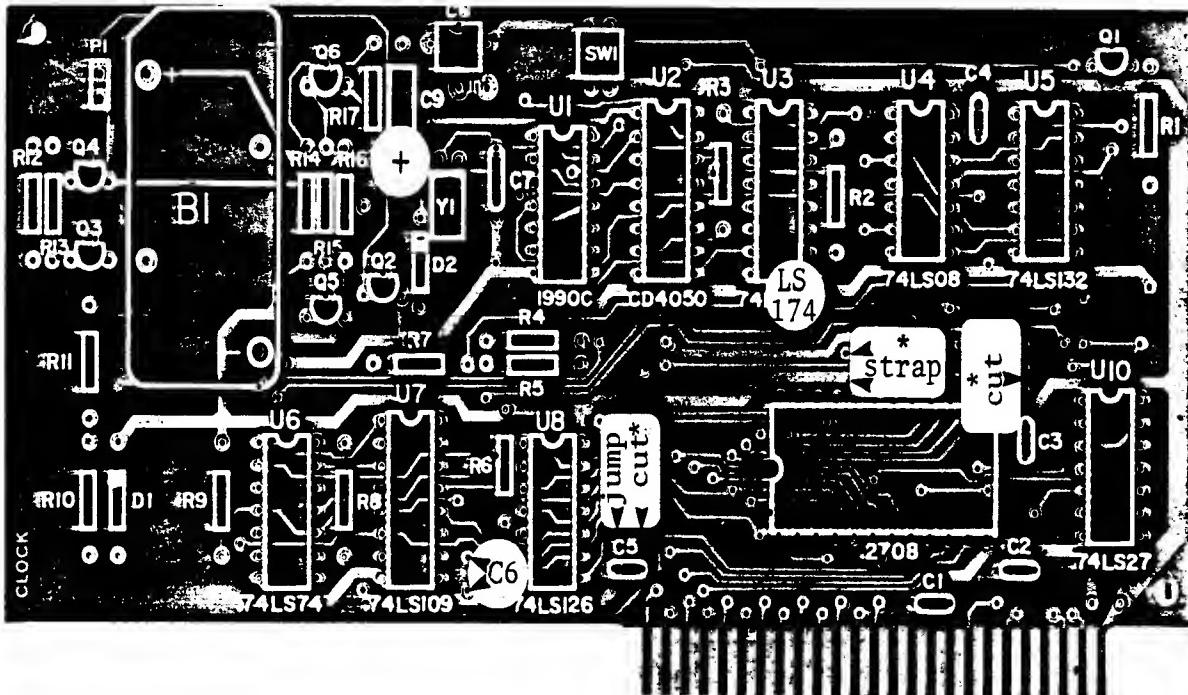
pin 1 →
 upper left for
 ALL sockets
 and ICs

JUMPERS
 _____ 2 - 2-pin male header as feed-thru @ IRQ & MNI
 _____ 1 - solder jumper on solder side for 12V supply for peripherals (as required)



GUIDE 10-9

PRO-TIME CARD: Versatile real time clock/calender used with DOS & ProDOStm operating systems. Gives access to year, month, day, hour, minute, second, for dating files. With optional transducer can give remote control of AC outlets. With power off, install in any slot 1 thru 7. Requires software (one disk) & firmware (one EPROM).



*MODIFICATION FOR
USE WITH
2716 EPROM:
Requires two cuts
& two jumpers as
shown on layout

SEQUENCE *INDICATES A PRECAUTION

DIODES D *Position banded end (cathode) of diodes towards the band on the layout

- 1 - 1N5226 @ D1
- 1 - 1N4001 @ D2

RESISTORS R $\frac{1}{4}$ watt, 5%

- 1 - 82 Ω @ R10
- 1 - 470 Ω @ R16
- 1 - 1 K Ω @ R15
- 2 - 3.3 K Ω @ R6,9
- 1 - 4.7 K Ω @ R17
- 3 - 10 K Ω @ R1,7,11
- 1 - 15 K Ω @ R14
- 5 - 47 K Ω @ R2,3,4,5,8
- 2 - 1 M Ω @ R12,13

SOCKETS *Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins have passed thru ALL holes

- 6 - 14-pin pin 1 →
- 3 - 16-pin
- 1 - 24-pin

CAPACITORS C *

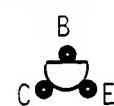
- 1 - .22 pF @ C7* Try 100pF
- 6 - 0.1 μ F Monolithic @ C1,2,3,4,5,6
- 1 - 4.7 μ F/16V Radial* @ C9 Match + of Radial with + on the layout
- 1 - 5-50 pF Trimcap @ C8 (fast/slow adjust)

CRYSTAL Y

- 1 - 32.768 KHz @ Y1

TRANSISTORS Q *Position EBC transistors leads as shown

- 5 - 2N3904 @ Q1,2,3,4,6
- 1 - 2N3906 @ Q5



SWITCH

- 1 - two-position DIP @ SW1 (set/protect switch)

CONNECTORS

- 1 - 2-pin header, male, 90° @ P1 (for optional transducer)

BATTERY

- 1 - 3.6 V rechargeable NiCad (GE DS3D) (or appropriate substitute)

INTEGRATED CIRCUITS *Match pin 1 of ICs with pin 1 on the layout

- 1 - 74LS08 @ U4
- 1 - 74LS27 @ U10
- 1 - 74LS74 @ U6
- 1 - 74LS109 @ U7
- 1 - 74LS126 @ U8
- 1 - 74LS132 @ U5
- 1 - 74LS174 @ U3

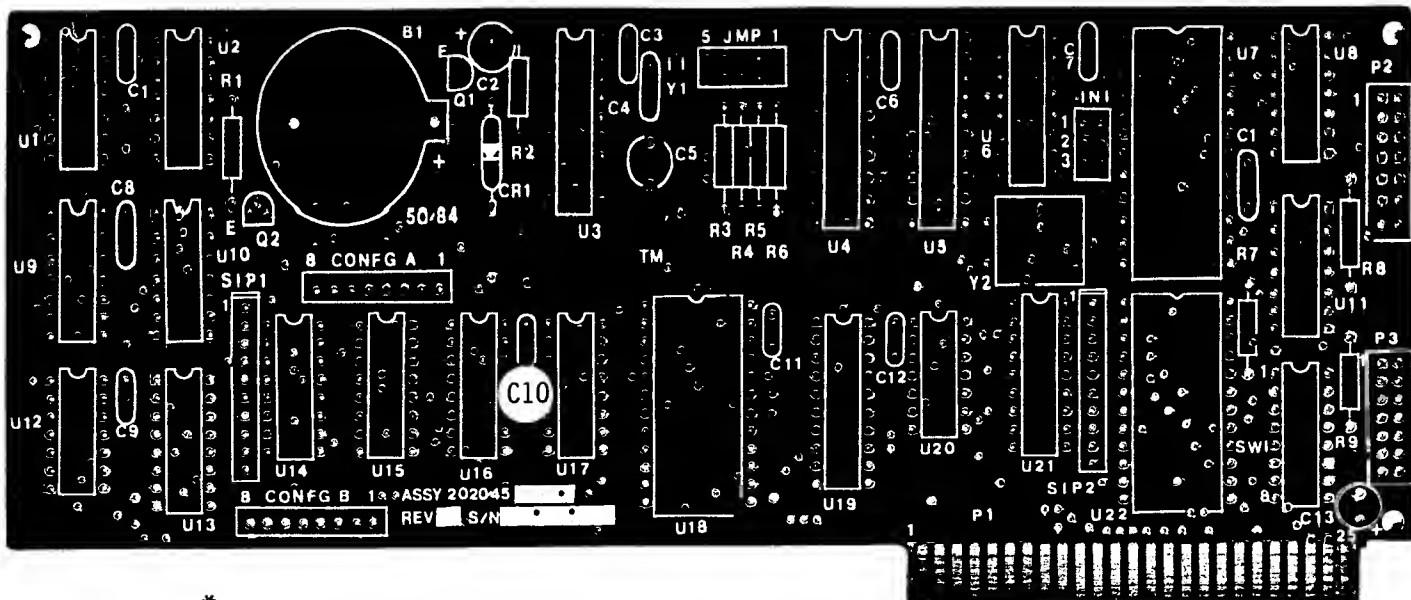
NuScope Associates



- 1 - UPD1990C (NEC) @ U1 clock IC
- 1 - CD4050 @ U2

GUIDE 10-10

MULTIFUNCTION II (IIe): Provides: serial printer port; RS232 asynchronous serial communications port for remote terminal or external modem; real time clock/calendar with battery back-up. With power off, install in slot 1. Requires software (one diskette) and firmware (one EPROM).



SEQUENCE *INDICATES A PRECAUTION

DIODE *Position banded end of diode towards the arrow

— 1 - 1N914 @ CR1

RESISTORS R $\frac{1}{4}$ watt, 5%

— 4 - 4.7 K Ω @ R1,7,8,9

— 5 - 10 M Ω @ R2,3,4,5,6

— 2 - 4.7 K Ω 10-pin SIP* bussed,
@ SIP 1,2. *Match pin 1 of SIP
with pin 1 on layout

SOCKETS *Match pin 1 of sockets with pin
1 on the layout. Check that ALL pins
have passed thru ALL holes

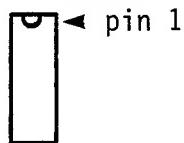
— 8 - 14-pin

— 6 - 16-pin

— 2 - 18-pin

— 3 - 20-pin

— 3 - 24-pin



CAPACITORS C *C1, above R7 is NOT equipped

— 1 - 22 pF @ C4

— 9 - 0.1 μ F Monolithic @ C1,3,6,7,8,9,
C10,11,12

— 2 - 1 μ F/16V Tantalum* @ C2,13
*Match + of Tantalum
with + on the layout

— 1 - 5-50 pF Trimcap @ C5

TRANSISTORS Q *Match ebc transistor leads
as shown on the layout

— 1 - 2N2907A @ Q1

— 1 - 2N2222A @ Q2

CRYSTAL Y

— 1 - 32.768 KHz @ Y1

— 1 - 5.068 MHz @ Y2* Fold crystal flat
against the card before soldering

SWITCH

— 1 - 8-position DIP @ SW1 -baud rate

HEADERS male, straight

— 2 - 1x8 @ CONFIG A,B -slot select

— 1 - 2x3 @ INI

— 1 - 2x5 @ JMP1 -set clock

— 2 - 2x7 @ P2 -printer port
@ P3 -communica. port

BATTERY Match + of battery with + on layout

— 1 - 3 V Lithium @ B1

INTEGRATED CIRCUITS * Match pin 1 of ICs
with pin on the layout

— 1 - 74LS00 @ U9 — 1 - 74LS367 @ U6

— 1 - 74LS04 @ U2 — 1 - 74LS373 @ U4

— 1 - 74LS08 @ U12 — 1 - 1488 @ U8

— 1 - 74LS21 @ U10 — 1 - 1489 @ U11

— 1 - 74LS32 @ U20 — 2 - 68A50 @ U7,22

— 1 - 74LS74 @ U1 — 1 - COM8116 @ U21

— 1 - 74LS133 @ U17 — 1 - M5832 @ U3

— 3 - 74LS138 @ U13 — 1 - 2732 @ U18

U14,15

— 1 - 74LS157 @ U16

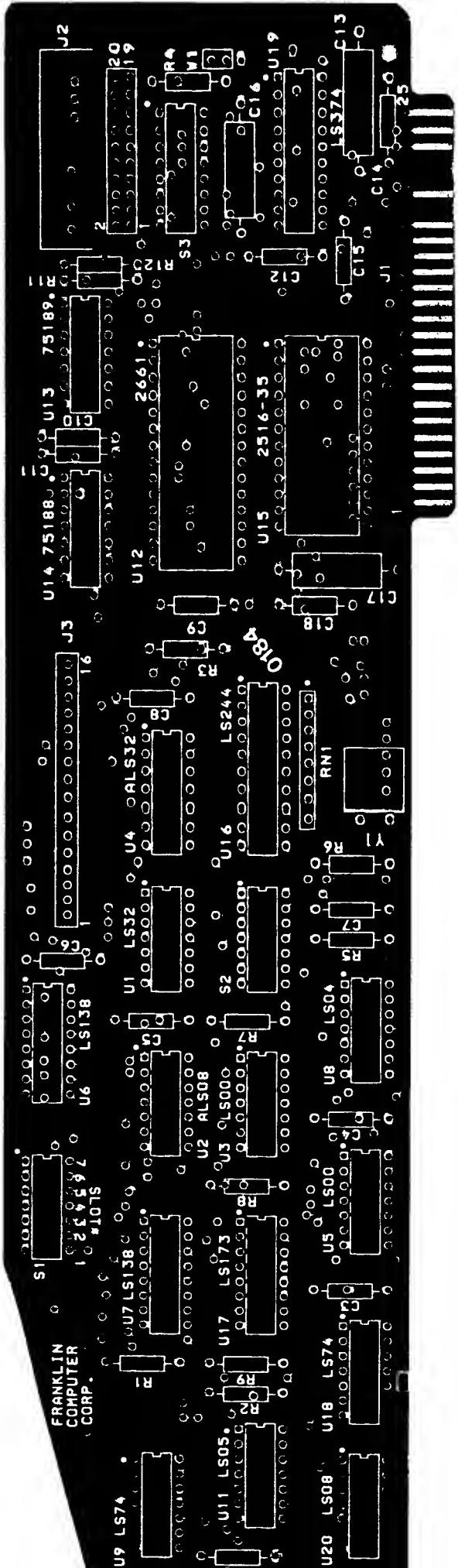
— 1 - 74LS245 @ U19

— 1 - 74LS273 @ U5



GUIDE 10-11

ACE DUAL I/O CARD: Centronics-compatible parallel printer interface and serial communication (RS232) interface on one card. With power off, install in slot 1 or 2. Use switch settings to control "phantom" slot assignment. Requires firmware (one EPROM). Documentation & schematics available from supplier.



*INDICATES A PRECAUTION

RESISTORS R $\frac{1}{4}$ watt, 5%

1 - 100 Ω @ R4

2 - 1.5 k Ω @ R5, 6

3 - 4.7 k Ω @ R1, 7, 8

6 - 10 k Ω @ R2, 3, 9, 10, 11, 12

1 - 1 k Ω 8-pin SIP* bussed @ RN1

*Match pin 1 of SIP with pin 1 (white dot) on the layout

*Match pin 1 of sockets with pin 1 on the layout. Check that ALL pins pass thru ALL holes

12 - 14-pin pin 1

3 - 16-pin

2 - 20-pin

1 - 24-pin

1 - 28-pin

CAPACITORS C

1 - 0.01 F Monolithic @ C7
14 - 0.1 F Monolithic @ C1, 2, 3, 4, 5, 6, 8,

1 - 1x2 header, right angle @ W1
C9, 10, 11, 12, 14, 15, 18

3 - 10 F/16V Axial* @ C13, 16, 17

*Match + of Axial with + on layout

1 - 1x20 header, right angle @ J2 - Serial

1 - shorting clip for W1

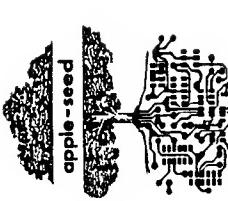
1 - 4.9152 MHz @ Y1

SWITCH

2 - 7-position DIP @ S1, S2
1 - 8-position DIP @ S3

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Associates



JAL I/O CARD (continued)

ROUTED CIRCUITS *Match pin 1 of ICs
with pin 1 on the layout. U10 is NOT
shown on the layout.

U2

- 74LS00

@ U3,5

U1

- 74LS04

@ U8

U1

- 74LS05

@ U11

U1

- 74LS08

@ U20

U1

- 74LS32

@ U1

U1

- 74LS74

@ U9,18 (TI only)

U2

- 74LS138

@ U6,7

U1

- 74LS173

@ U17

U1

- 74LS244

@ U16

U1

- 74LS374

@ U19

U1

--74ALS08 @ U2
U1 - 74ALS32 @ U4 (74LS32)

U1

- 75188 @ U14 (MC1488)
U1 - 75189 @ U13 (MC1489)

U1

- 2661 USART @ U12

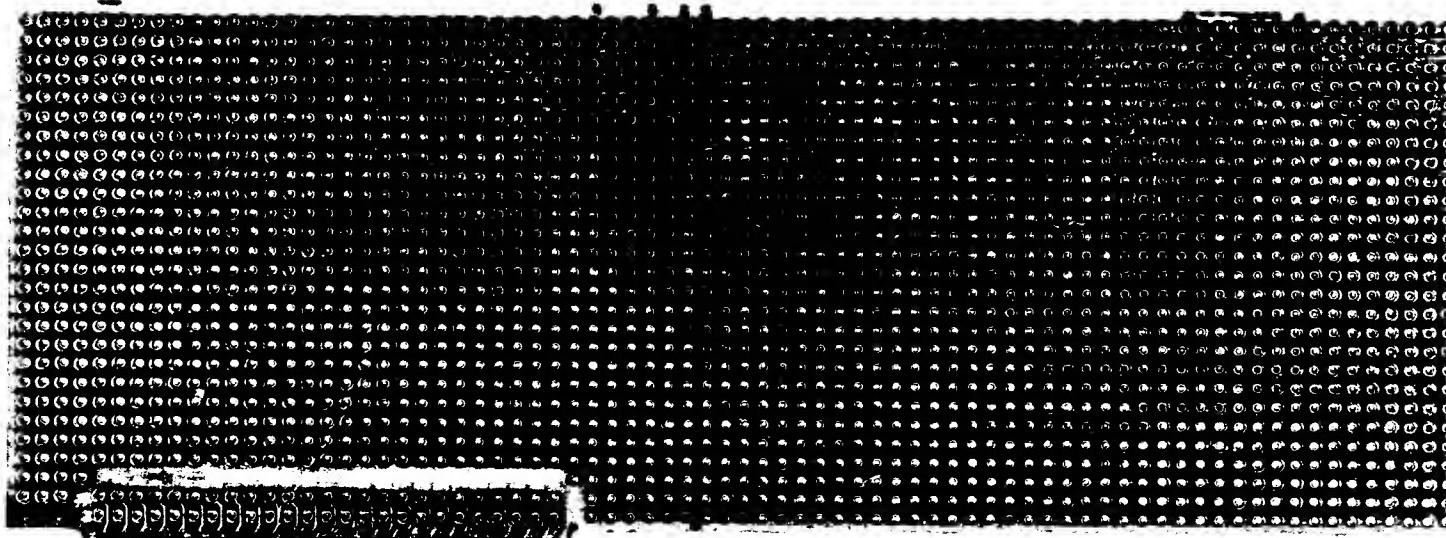
U1 - 2716 EEPROM @ U15

GUIDE 11-1

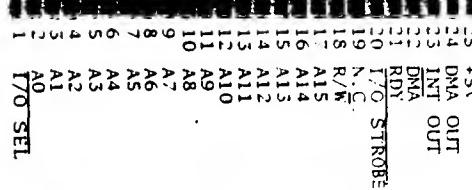
PROTOTYPING CARD I: For high-density wire wrap prototyping work. Has over 1,900 solder pads on 0.1 inch spacing.



COMPONENT SIDE



SOLDER SIDE

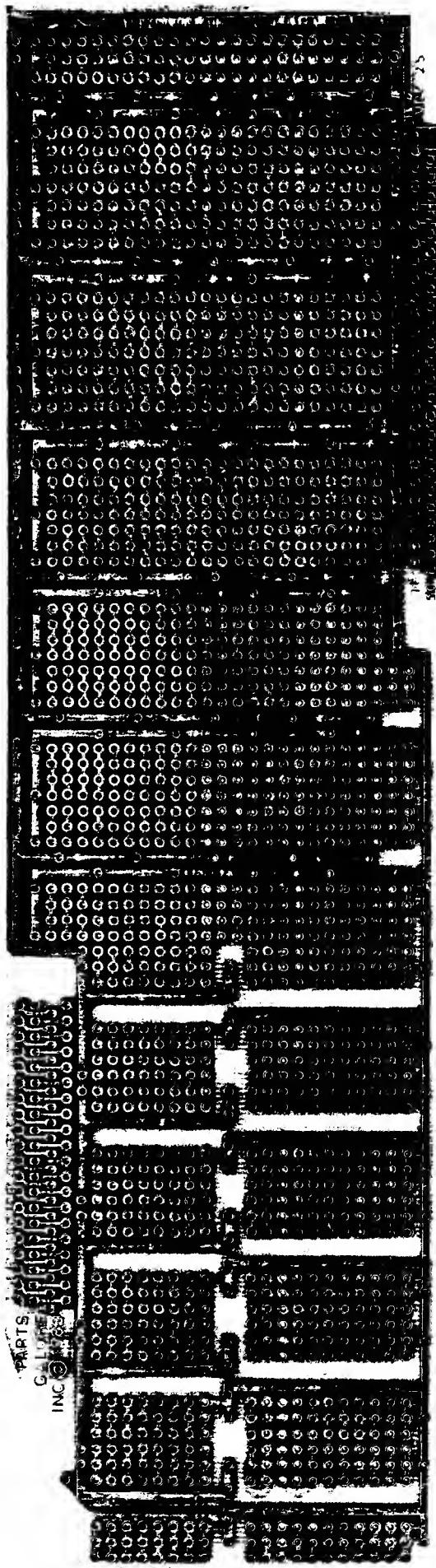


GND
INT IN
NMT
TRO
RES
N.C.
-12V
-5V
7N
36
35
34
33
32
31
30
29
28
27
USER 1
39
40
41
42
43
44
45
46
47
48
49
50
DEFT
SEL
+12V



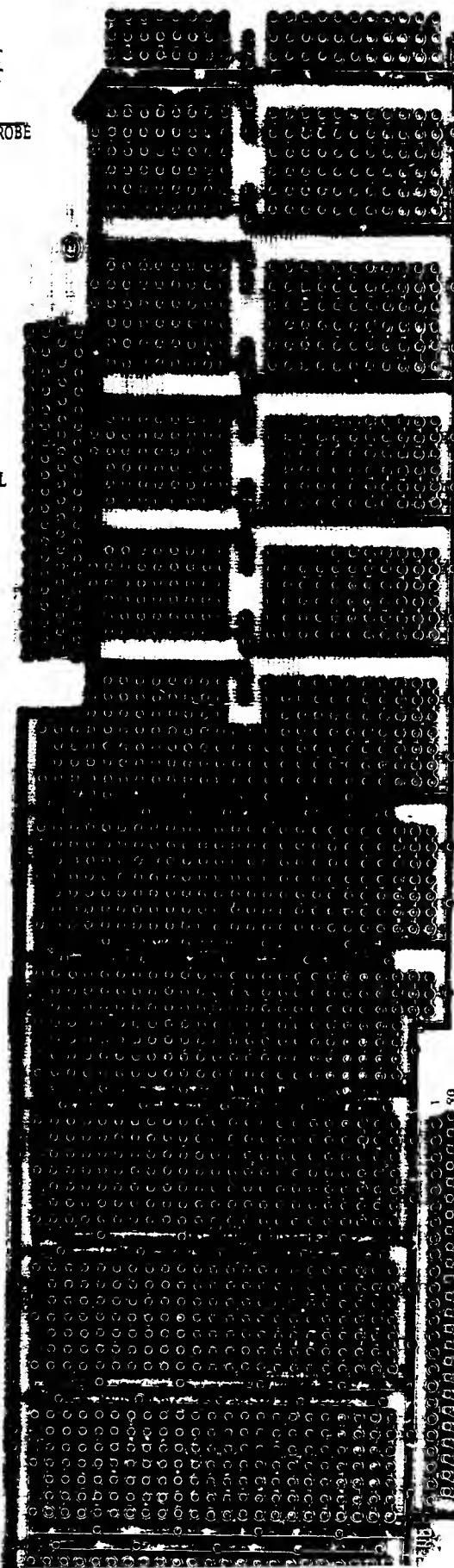
GUIDE 11-2

PROTOTYPING CARD II: For point-to-point hand-wired custom work. Has on-board +5 V power bus & ground bus.



COMPONENT SIDE

25 +5V
24 DMA OUT
23 INT OUT
22 DMA
21 RDY
20 I/O STROBE
19 N.C.
18 R/W
17 A15
16 A14
15 A13
14 A12
13 A11
12 A10
11 A9
10 A8
9 A7
8 A6
7 A5
6 A4
5 A3
4 A2
3 A1
2 A0
1 I/O SEL

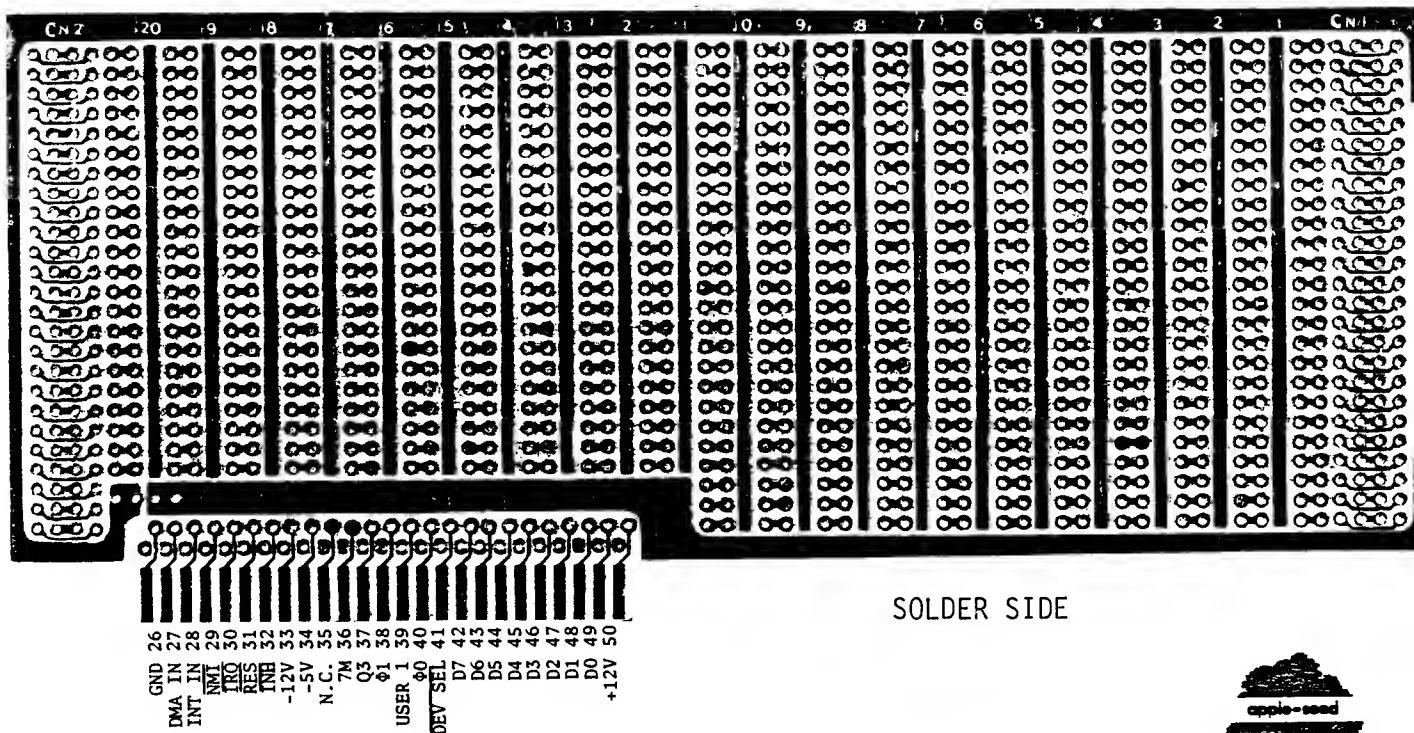
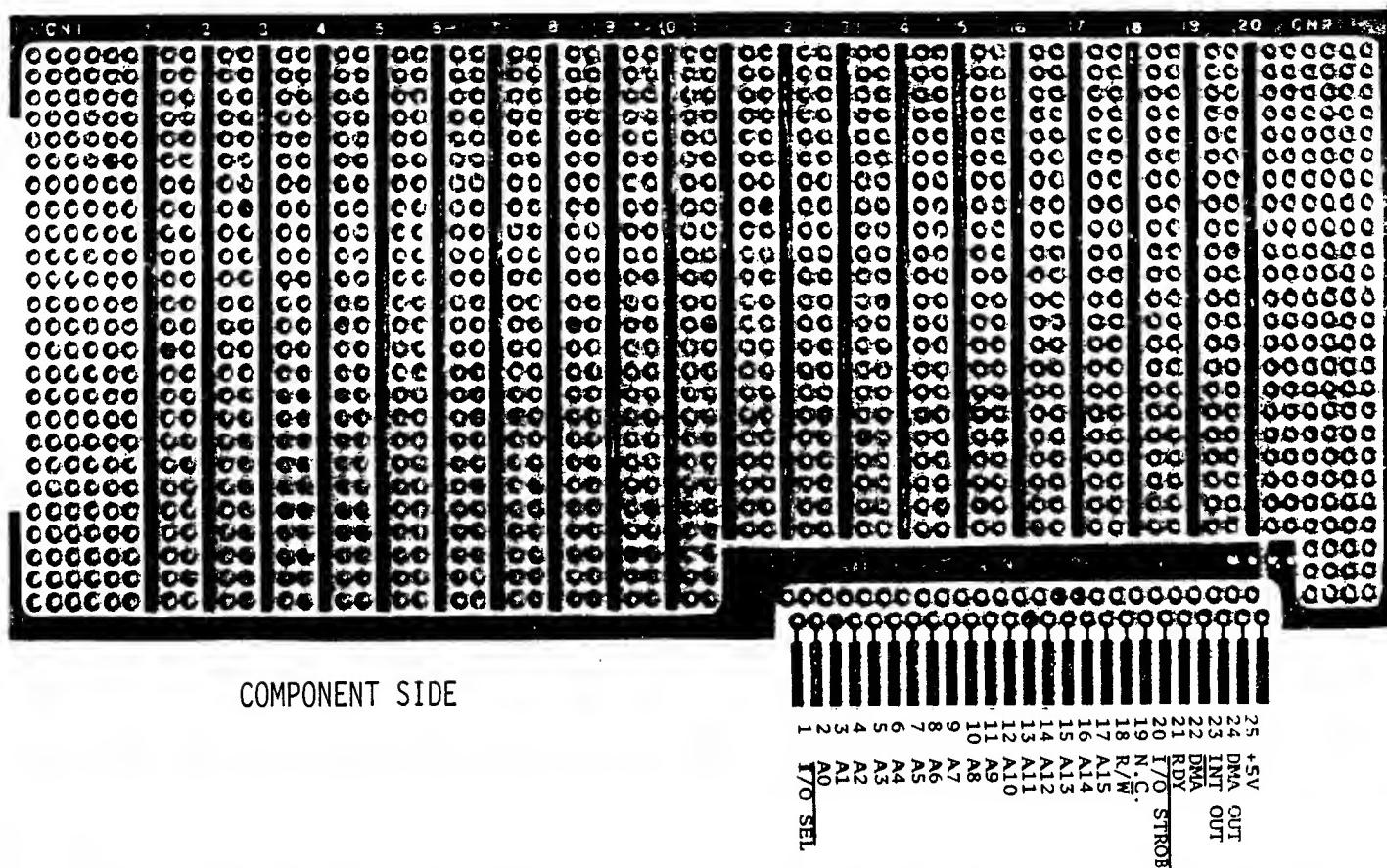


SOLDER SIDE

NuScope Associates

GUIDE 11-3

PROTOTYPING CARD III: For point-to-point hand-wired custom work.

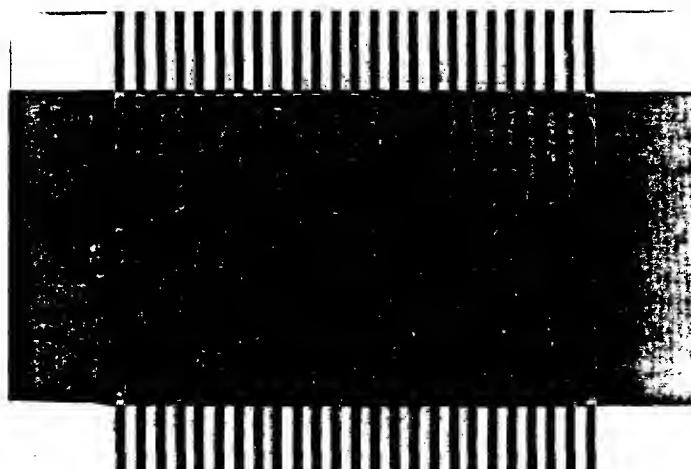


GUIDE 11-4

EXTEND-A-CARD: Lifts card 5 cm above the motherboard for easy testing & servicing.

Secure a 50-pin card edge connector to the top of the card so that the pins of the connector line up with the traces on the card. Centre the connector and solder the end pins to the card. Check that pins are correctly lined up. Solder the remaining pins to the card. Appropriately label one end of the connector pin 1 and pin 26.

SOLDER CARD EDGE CONNECTOR
TO
TOP OF CARD



gold fingers

CONNECT TO MOTHERBOARD

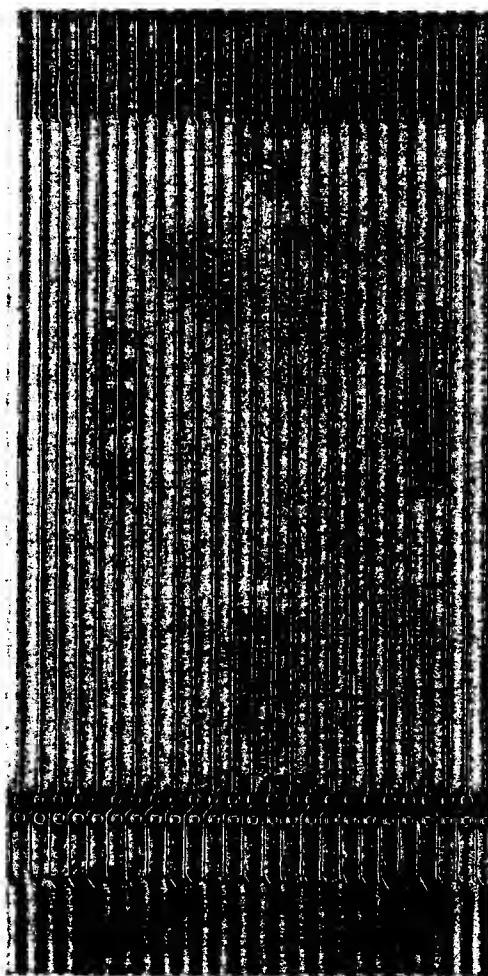


GUIDE 11-5

EK CARD EXTENDER: Lifts card 11 cm above the motherboard for ease of servicing testing and troubleshooting.

Secure a 50-pin card edge connector to the top of the card so that the pins of the connector line up with the traces on the card. Solder the four end pins to the card. Check that the rest to the pins are aligned. Solder the remaining pins to the card. Appropriately label one end of the connector pin 1 and pin 26.

SOLDER CARD EDGE CONNECTOR
TO
TOP OF CARD

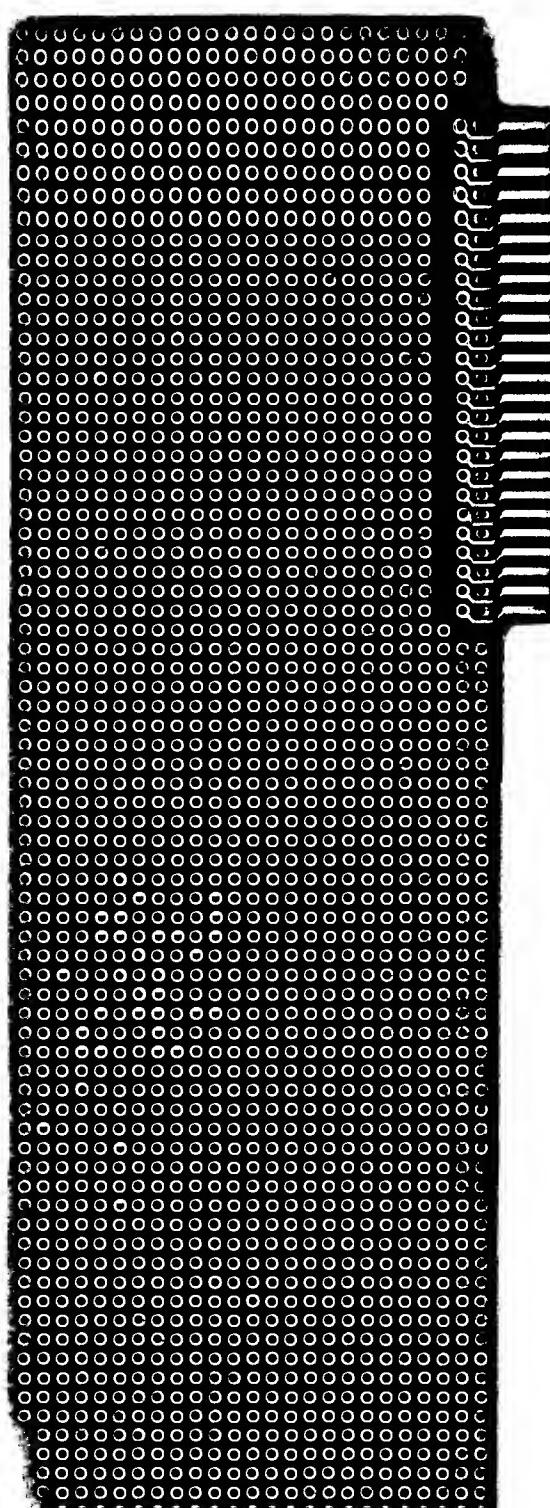


INSTALL IN MOTHERBOARD

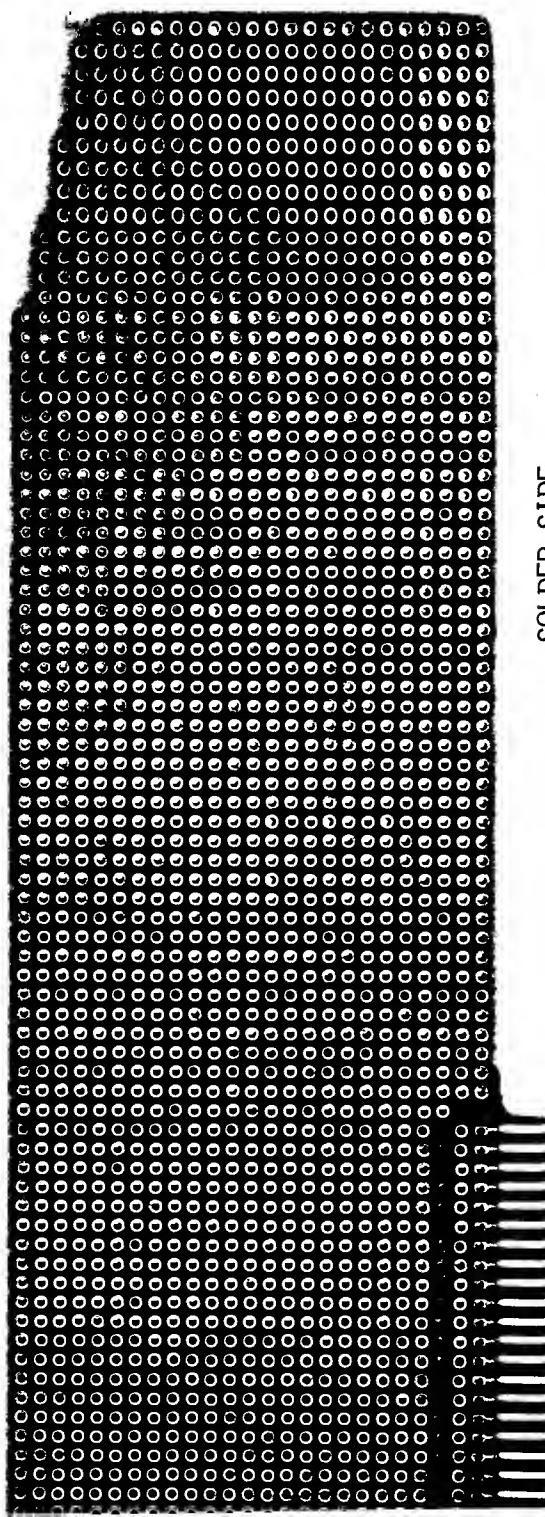


GUIDE 11-6

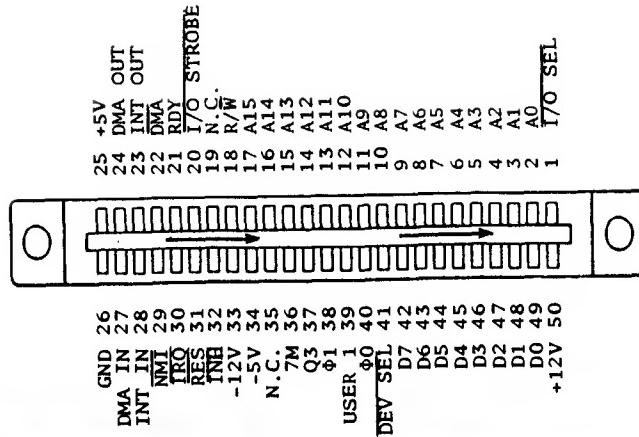
PROTOTYPING IV: For high-density wire wrap prototyping work. Has approximately 2,000 solder pads on 0.1 " spacing.



COMPONENT SIDE



SOLDER SIDE

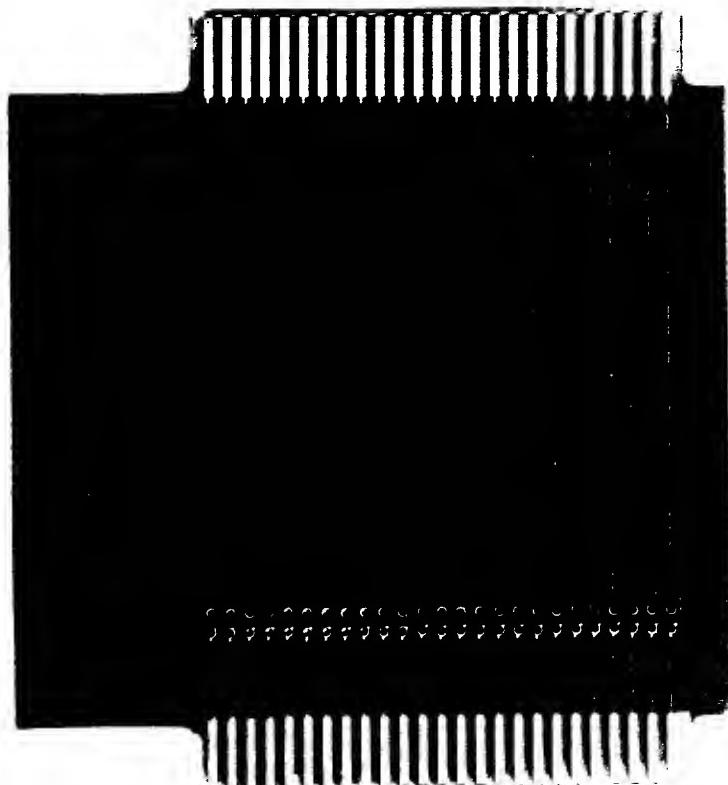


GUIDE 11-7

JK EXTENDER: Lifts card 9 cm above the motherboard for easy testing & servicing.

Secure a 50-pin card edge connector to the top of the card so that the pins of the connector line up with the traces on the card. Centre the connector and solder the end pins to the card. Check that pins are correctly lined up. Solder the remaining pins to the card. Appropriately label one end of the connector pin 1 and pin 26.

SOLDER CARD EDGE CONNECTOR
TO
TOP OF CARD



gold fingers

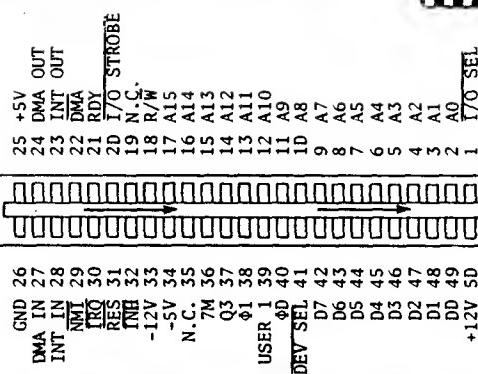
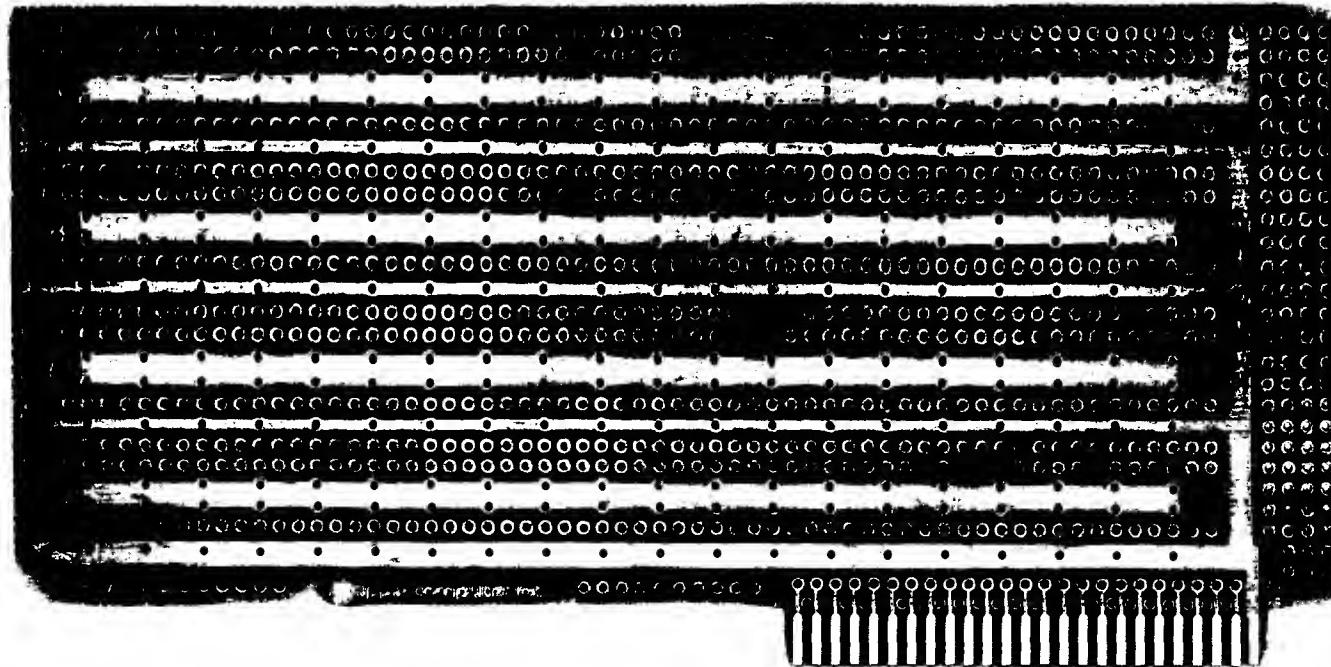
CONNECT TO MOTHERBOARD

NuScope
Associates



GUIDE 11-8

APL PROTOTYPING V: Two-sided prototyping PCB for point-to-point or wire-wrap custom work. Solder pads are on 0.1 spacing. Has power and ground bus. Documentation available from supplier.



SOLDER SIDE

